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

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Abstract. This paper studies trait concealment in economic models of discrimination using sexual orientation in the United States as a working example. A generalized concealable characteristics framework is introduced with emphasis on the implications for research designs and empirical measurement. Evidence using a new source of plausibly exogenous variation in male same-sex attraction coupled with measures of county-of-birth tolerance of homosexuality documents patterns of concealment and its corresponding impact on individual outcomes. I find that men who were more likely to develop same-sex attraction yet born in more homophobic locations were significantly less likely to engage in same-sex cohabitation through age 45 compared to similar men from less homophobic counties. Changes in identity investments (conservative gender ideology and religious adherence) conform with this pattern, and sizable penalties to mental health and educational outcomes accrue to men from more homophobic backgrounds. Labor market outcomes, however, appear to generally be unaffected. I hypothesize that men who experience same-sex attraction yet conceal it are compensated for this choice despite their diminished human capital.

Keywords: discrimination, concealable characteristics, sexual orientation, mental health

JEL: J12, J16, J70

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1. Introduction

Economic research on discrimination, both theoretical (Becker [1957]) and empirical (e.g. Goldin and Rouse [2000], Bertrand and Mullainathan [2004], Charles and Guryan [2008]), has classically assumed that minority traits are perfectly observable. In the context of race and sex, which form the general foundation of existing research, such an assumption is innocuous. In this paper, however, I propose a departure from this body of work through the consideration of an alternative class of traits: concealable characteristics. These traits are precisely defined by the fact that they are not publicly observable. Instead, agents make an active decision whether to disclose or conceal their minority status.

Concealment has important implications from both a theoretical and empirical perspective. Given the option to conceal, individuals who self-identify their minority status only represent a subset of individuals for whom the benefits of disclosure outweigh the costs, which is a classic case of selection bias. A potential consequence of this bias, for example, could be that those likely to face the worst discrimination conceal their type and generate censoring in the distribution of realized discrimination (i.e. what is actually measurable ex-post in equilibrium). As a result, estimates based on self-reported status would underestimate the true magnitude of discrimination.

If we suppose that the researcher could measure innate preferences, selection bias could be avoided but standard models which focus on wage penalties may fail to capture the nuanced implications of discrimination. For instance, the costs of discrimination may be dispersed across multiple outlets (e.g. labor market penalties, mental health costs, etc) and the relevant channel will uniquely depend on the individual’s concealment status. This stands in contrast to Becker [1957], which concludes that zero or minimal measured wage penalties is an indication that all or most minorities have found non-discriminating firms and avoided punishment.¹

¹As an extreme example, consider the case of Iran where homosexuality is punishable by death. In thirty years, relatively few individuals have been executed [Boroumand Foundation], but this is not evidence the
Psychologists have long recognized that there exists numerous channels through which stigma can affect minority individuals. Herek [2004] focuses on three distinct modes of transmission: enacted stigma, felt stigma and internalized stigma. This formulation distinguishes between prejudicial acts carried out against minorities (enacted), minority fear and anticipation of prejudicial acts (felt), and self-directed stigma (internalized). Concealment can reduce the chances of experiencing enacted stigma, but may exacerbate felt and internalized stigma compounding mental health and anxiety disorders. Psychologists also point to an additional drain on cognitive resources resulting from the constant vigilance needed maintain a false identity [Major and O’Brien, 2005].

The specific application being considered in this paper is innate sexual orientation, a concept that is theoretically distinct from self-identified sexual orientation. The former category measures an individual’s private sexual attraction, while the latter is the public presentation of one’s sexual orientation. The features of a concealable characteristics framework, however, also extend to work on cultural identity and assimilation for immigrants (Arai and Skogman-Thoursie [2009], Constant et al. [2009]), ethnic identification (Mason [2004]), religious attachment (Chen [2010]), political allegiance (Kuran [1995]) and student ability (Akerlof and Kranton [2002], Austen-Smith and Fryer [2005]). All echo similar mechanisms (e.g. motives to conceal identity or other opaque attributes). A generalized concealable characteristics framework could serve to unify these disparate research agendas.

Original empirical analysis is presented to illustrate how potential concealment shapes life-cycle outcomes using data from the National Longitudinal Survey of Youth 1979. The study leverages the fraternal birth order (FBO) hypothesis from developmental psychology as a proxy measure for innate sexual orientation in lieu of self-identified sexual orientation. 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 or report same-sex attraction. This proxy for innate sexual orientation is used in conjunction with varying degrees of juvenile exposure local discrimination against the lesbian, gay and bisexual community based on the respondent’s county of birth in the United States. Studying how these two sources of variation interact will allow the paper to consider how life-cycle trajectories change in response to increasing motives to conceal, and whether early life exposure to anti-gay policies and attitudes has long-term implications past adolescence.

This paper does not seek to explain why discrimination against the lesbian, gay, and bisexual (LGB) community exists, nor why discriminatory attitudes have changed 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.

The remainder of this paper is organized in the following manner. 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. Section 5 presents the empirical results. Finally, Section 6 provides concluding remarks.

2. Motivation

The lesbian and gay community in the United States has been highly stigmatized for many years. Throughout the 1970’s and 1980’s roughly 70 percent of respondents to the General Social Survey thought that sexual relations between adults of the same sex was “always wrong” (see Figure 1). In fact, Moore [1993] found that 37 percent of Americans (30 percent of women and 45 percent of men) preferred that “homosexuals stay in the closet”, a colloquialism for hiding same-sex attraction. Recent decades have witnessed warming attitudes, yet these changes have been slow to translate into the legislative change.
Physical and verbal harassment also remain relatively common experiences, and, if looking beyond the United States, many countries around the world still outlaw homosexuality with consequences as severe as capital punishment.

Studies seeking to measure the extent of employment discrimination generally find negative wage impacts for gay men (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 sexual minorities, including both gay men and lesbian women (see Tilcsik [2011], Hebl et al. [2002], Jones [1996], Walters and Curran [1996]).
The impacts of stigma related to sexuality also extend beyond labor markets. The LGB community has also been associated with elevated rates of violence and report more fear of victimization (see Herek [1991], Dunbar [2006], Harris Interactive [2006]). Researchers have also found gay youth are more likely to report physical, verbal and sexual abuse in schools (Bochenek and Brown [2001], O'Shaughnessy et al. [2004], Kosciw et al. [2008], Saewyc et al. [2006]).

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 LGB 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 thought same-sex sexual behavior was a symptom or type of a mental health disorder, the consensus among psychologists for several decades has concluded that negative mental health outcomes observed for gay men and women reflect a psychological response to the animus and prejudice faced by sexual minorities in everyday life (Meyer [2003]).

With substantial risks to disclosure, sexual minorities should be highly motivated to conceal their type. Supporting this concept, Badgett et al. [1992] estimate that between 28 and 72 percent of self-identified gay men and women actively conceal their sexual orientation to some degree to avoid discrimination.² Because this estimate is based on a convenience sample of individuals who self-identify as gay to some degree, it is hard to say whether or not rates of concealment in the overall population should be higher or lower.

The fact that some gay men and women still choose to disclose their identity suggests there are benefits to disclosure and costs to nondisclosure. Goffman [1963] discusses the

²See also Francis [2008] for analysis of the impact of the AIDS epidemic on the sexual identity of men and women in the United States.
active effort require to maintain a secret or manage a stigmatized identity for sexual minorities, attenuating the productivity and effectiveness of “closeted” individuals. Case studies of gay men and lesbians (Weinberg and Williams [1974], Schneider [1986], Hall [1989], Woods [1993], Friskopp and Silverstein [1995]) also provide tentative evidence regarding modes of concealment and the repercussions of nondisclosure in the work setting. Findings from this literature indicate that sexual minorities 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 been theorized but have not been empirically established.

Related work in health psychology has considered the relationship between nondisclosure of sexual orientation and physical health. Cole et al. [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 using 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 infectious disease among those who concealed their sexual orientation. Given the potential link between concealment behavior, socio-economic background, and, unobserved health practices, however, it remains unclear whether nondisclosure has a truly independent effect on physical health.

A remaining problem in the literature is the lack of knowledge regarding individuals who experience same-sex 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 innovate ways 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 concealment into traditional discrimination models requires enabling identity choice for agents. The relevant model for this feature depends on whether society discriminates based on the underlying status itself or simply the expression of this status. For underlying preferences, signaling models would be more appropriate whereas for behavior-based discrimination, discrete choice is sufficient. In this work, I focus on behavior-based discrimination both for its simplicity as well as its relevance to the application.

In this simple model, two agents are randomly matched and engage in joint production with the resulting output $\pi$. The presenting agent ($p$) is endowed by nature with a concealable trait $\tau_p$, which can take the value $M$ if the presenting agent is a member of the majority or $m$ if he is a minority. The presenting agent’s type is private information. What he decides to publicly disclose regarding $\tau_p$ is represented by $T_p \in \{M,m\}$. It is assumed that if $\tau_p = m$, presenting agent can still credibly conceal his type because he is randomly drawn from a population containing both majority and minority types.

The responding agent ($r$) has distaste parameter ($d_r$) over being paired with a minority, which is randomly drawn from the distribution $D \in \mathbb{R}^+$ and is only observed by the presenting agent once the pair is matched. She sells $\pi$ at a price of 1, and decides how to divide the proceeds.

The responding agent seeks to optimize the following objective function:

\[^3\text{"Identity" in this context is not a arbitrary pooling mechanism as is the case in Akerlof and Kranton [2000] and related work. Instead, fundamental differences in the population are endowed by nature. When I refer to identity, I simply mean the public expression of the privately known differences.}\]
Definition 1. The Responding Agent’s Objective Function

\[
\max_{\lambda_M, \lambda_m} Q_r(\lambda_M, \lambda_m, \pi, d_r) \equiv \begin{cases} 
1 \left[ T_p = M \right] \times q_r(\lambda_M \pi) + (1 - 1 \left[ T_p = M \right]) \times (q_r(\lambda_m \pi) - d_r)
\end{cases}
\]

where, \(1 \left[ T_p = M \right]\) is an indicator function recording whether the presenting agent announces he is member of the majority. The model is neutral on the particular functional form of \(q_r\) in order to accommodate a range of possible applications. For instance, \(-q_r\) could be the firm’s cost minimization equation with \(q_r = \lambda \pi - \pi\). In this setting, \(\lambda \pi\) would be akin to the wage rate paid to the presenting agent. It could also model an altruistic parent who values her child’s utility: \(q_r = V_r((1 - \lambda)\pi) + \theta V_p(\lambda \pi)\).

The responding agent optimizes this objective function by setting two different compensation rates \(\lambda_M\) and \(\lambda_m\) which correspond to the presenting agent’s announced type. The differential pricing serves two purposes. First, it allows the responding agent to allocate more of the \(\pi\) to herself in the event that the presenting agent decides to reveal his type, which will compensate her for pairing with a minority (i.e. she can set \(\lambda_m\) and \(\lambda_M\) such that \(q_r(\lambda_m \pi) - d_r = q_r(\lambda_M \pi)\)). Second, it gives the responding agent the ability to manipulate the presenting agent’s concealment choice. Even if \(q_r(\lambda_m \pi) - d_r < q_r(\lambda_M \pi)\), the responding agent will be satisfied with \(\lambda_m\) and \(\lambda_M\) if the discrepancy between the two compensation rates forces the presenting agent to select \(T_p = M\). Because of these two dynamics, the relative compensation for majority types will be weakly higher compared to minority types (i.e. \(\lambda_M \geq \lambda_m\) and \(\lambda_M > \lambda_m\), \(\forall d_r > 0\)).

Depending on the specification of \(q_r\), it may be necessary to assume that factors outside the model prevent the responding agent from arbitrarily setting either or both \(\lambda\) equal to zero. In the context of an employer-employee relationship, introducing mobility into the model and allowing competition between firms would generate a price floor for both \(\lambda_M\) and \(\lambda_m\). In the context of an altruistic parent (where mobility is an unrealistic feature), such assumptions can be unnecessary as the model can internally generate non-zero \(\lambda\)’s.
The presenting agent seeks to maximize his indirect utility:

**Definition 2. The Presenting Agent’s Objective Function**

\[
\max_{T_p} Q_p \equiv 1[\tau_p = M] \times V_p(\lambda_M \pi, \psi - 1[\tau_p = m] \times \rho) + (1 - 1[\tau_p = M]) \times V_p(\lambda_m \pi, \psi - 1[\tau_p = M] \times \rho)
\]

\(V_p\) is an indirect utility function that is increasing but concave in consumption. If the presenting agent chooses to conceal his type, he will receive \(\lambda_M \pi\) in total consumption. If he chooses to disclose his type, he will instead receive \(\lambda_m \pi\).

Without additional features, a trivial solution for the presenting agent is to choose concealment when facing any positive amount of animus in order to avoid the costs of disclosure. Costless concealment, however, does not fit observed patterns in the real world; minorities with a choice to conceal regularly disclose their true identity in spite of the potential negative consequences. This indicates that concealment comes at a cost or disclosure has a non-pecuniary benefit.\(^4\) These two potential motivations are isomorphic, and so for simplicity, I frame the model just in terms of costs to nondisclosure.

To this end, I introduce mental health capital (\(\psi\)) to the production of indirect utility which positively contributes to utility production (with decreasing returns). When the presenting agent chooses to conceal (i.e. \(\tau_p \neq T_p\), he must sacrifice a \(\rho\) mental health as consequence of nondisclosure, which results in a lower amount of mental health capital: \(\psi'\). As such, a minority presenting agent faces a trade-off between sacrificing additional consumption or sacrificing mental health both of which lower overall utility. Whether to conceal or disclose depends on whether \(V_p(\lambda_M \pi, \psi')\) is greater or less than \(V_p(\lambda_m \pi, \psi)\),

\(^4\)In fact, psychologists note that concealing sexual orientation 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], Ulrich et al. [2003]).
which can be decomposed into two components:

\[ V_p(\lambda_M \pi, \psi') - V_p(\lambda_m \pi, \psi) = V_p(\lambda_M \pi, \psi') - V_p(\lambda_M \pi, \psi) + V_p(\lambda_m \pi, \psi) - V_p(\lambda_m \pi, \psi) \]

\[ = \Psi + \Lambda(d) \]

\( \Psi \) is the utility cost of the negative shock to mental health imposed by concealment conditional on a given level of income. \( \Lambda(d) \) is the utility gain of additional consumption from the avoidance of direct discrimination. The presenting agent will choose concealment when \( -\Psi < \Lambda(d) \) and disclosure when \( -\Psi > \Lambda(d) \). Supposing there exists \( d_r = d^*_r \), such that \( -\Psi = \Lambda(d^*_r) \), the presenting agent will be neutral between the two options. For \( d < d^*_r \), the presenting agent will choose to disclose and for \( d > d^*_r \) he will choose to conceal.

To better emulate real world dynamics, I incorporate two final features. First, I allow the costs of concealment to covary with the level of potential discrimination the presenting agent is facing. The specific mental health penalty \( \Psi \) will depend on the severity of the discrimination that one is hiding from. Second, I introduce heterogeneity in the presenting agent’s ability \( \alpha \) which can influence both \( \Psi \) and \( \Lambda \). The relationship between \( \alpha \) and \( \Psi \) can be motivated by the potential for ability level to help mediate or exacerbate mental health costs. The relationship between \( \alpha \) and \( \Lambda \) is the direct result of allowing \( \pi \) to be a function of \( \alpha \), where higher ability individuals are able to produce more total output. The resulting choice to conceal or disclose the comes down to whether \( -\Psi(d_r, \alpha_p) \) is greater than or less than \( \Lambda(d_r, \alpha_p) \).

**Proposition 1.** Given a population of responding agents, \( \mathcal{R} \), with heterogeneity over \( d_r \in \mathcal{D} \) optimizing Definition 1; a population of presenting agents, \( \mathcal{P} \), with randomly assigned values of \( \tau_p \in \{M,m\} \) and \( \alpha_p \in \mathbb{R} \) optimizing Definition 1; a matching process that randomly pairs members of \( \mathcal{R} \) with \( \mathcal{P} \); and, assuming that \( \exists \mathcal{D}^* \subset \mathcal{D} \) such that \( \forall d_r \in \mathcal{D}^* \) then \( -\Psi(d_r, \alpha_p) < \Lambda(d_r, \alpha_p) \) holds; then, the following is true:

- \( \tau_p = T_p \quad \forall p \in P \quad s.t. \quad \tau_p = M \)
Proposition 1 states that given the setup of the model: (1) all majority presenting agents will truthfully reveal their type, (2) a subset of the minority presenting agents will disclose their type because the concealment costs outweigh the disclosure gains, and (3) the remaining minority presenting agents will not disclose their type because the gains cannot justify the costs. While the fact that some minorities choose to conceal their type is a straightforward conclusion in this model, it is worth highlighting because it is a mechanism that has not been previously explored in the literature.

In Becker [1957], sorting between firms is the only option for avoiding discrimination in the labor market, and given sufficient non-discriminatory firms, the market wage for minorities will not be penalized. As a result, the labor market will be segregated. By contrast, in my model, concealment is the sole escape mechanism. The underlying difference between these two approaches is based in different assumptions regarding search costs and information asymmetries. The conclusions of the Becker model rely on costless search and mobility between firms as well as perfect observability of $d_r$. Instead, my model implicitly assumes infinite search costs and zero observability of $d_r$ ex-ante. These assumptions are the direct result of the model setup in which agents are randomly paired (i.e. $\tau_p \perp d_r$) and the presenting agents cannot rematch. Since the goal of the model is to isolate the influence of concealment, I am comfortable with these assumptions. In reality, however, there is likely a mixture these two extreme positions, making observed outcomes a combination of Becker’s and my own theoretical results.

**Corollary 1.** Given the assumptions made in Proposition 1, and further assuming that $D^* \neq R^{++}$:

- $\exists \ p \in P \ s.t. \ \tau_p = m, \ \tau_p = T_p \ and \ d_r \neq 0.$
Corollary 1 states that despite the concealment behavior pointed out in Proposition 1 some minorities will still be observably penalized directly by the responding agent for their type. The range of \( d_r \in D^* \) will be censored due to concealment and hence unobservable in equilibrium, but, because in some cases the concealment costs will outweigh the benefit of avoiding direct penalties, measurable discrimination in the population will exist.

At this point, several interesting questions can be asked with this setup. What type of censoring are we still likely to observe in the realized distribution of \( d_r \)? Does this censoring lead to over or under estimates of \( E[d_r] \)? How does the incentive to conceal change over the ability spectrum? Are those who are most likely to disclose their type positively or negatively selected? Will the range of observed \( d_r \) vary across \( \alpha \)? Without imposing additional assumptions, these questions are theoretically ambiguous and need to be addressed empirically. But, in order to understand the mechanisms that could generate the different results, I introduce several potential assumptions and trace out their implications for these questions.

Given this framework, the relative utility gain from consumption changes due to concealment (\( \Lambda(d_r, \alpha_p) \)) will be weakly positive. This gain will grow with respect to \( d_r \) and shrink with respect to \( \alpha_p \) due to the concavity of indirect utility. \( \Psi(d_r, \alpha_p) \) measures the utility loss from the mental health penalty and will be weakly negative. Whether this gap grows or shrinks with \( d_r \) or \( \alpha_p \) depends on the specific features of the model. For instance, if \( \Psi \) is influenced by guilt of concealment and lessens with high \( d_r \), the gap could shrink. On the other hand, if changes in the mental health penalty are driven by the anxiety of being found out which may grow with animus, the gap would widen. This leads to two potential assumptions.

**Assumption 1.** “Guilt Costs” \( \frac{\partial \Psi}{\partial d_r} < 0 \)

**Assumption 2.** “Anxiety Costs” \( \frac{\partial \Psi}{\partial d_r} > 0 \)
Under Assumption 1, the relative incentive to conceal becomes more attractive as $d_r$ grows. The reductions in indirect utility from the consumption losses will get larger and mental health penalties will get smaller with higher levels of $d_r$ making concealment increasingly more attractive. In this context, the observed average level of $d_r$ in the population would underestimate the true average level of $d_r$ because the higher ranges of $d_r$ would never be observed in equilibrium. Under Assumption 2, however, the relationship between the motive to conceal and $d_r$ is ambiguous. As $d_r$ gets larger, presenting agents face a larger consumption penalty but also higher psychic costs. If $-\frac{\partial \Psi}{\partial d_r} < \frac{\partial \Lambda}{\partial d_r}$, meaning that mental health penalties grow with $d_r$ but at a sufficiently slow rate to not overweigh the direct consequence of $d_r$, then the same conclusions can be made as in the scenario with Assumption 1. These conclusions are summarized in Proposition 2.

**Proposition 2.** Given structure of Proposition 1, and assuming that Assumption 1 holds or that $-\frac{\partial \Psi}{\partial d_r} < \frac{\partial \Lambda}{\partial d_r}$:

- $Pr[\tau_p = T_p|d_r] \leq Pr[\tau_p = T_p|d'_r] \quad \forall d_r > d'_r$
- $\int d_r \times 1[\tau_p = T_p|d_r] dd_r \leq \int d_r dd_r$

The relationship between psychic costs and ability level is unknown and may vary across the ability spectrum. Higher ability agents may be better equipped to cope with stress which could lessen the utility loss from mental health penalties. They also may be more introspective and self-critical which could exacerbate mental health costs.

**Assumption 3.** “Coping Psyche” $\frac{\partial \Psi}{\partial \alpha_p} < 0$

**Assumption 4.** “Critical Psyche” $\frac{\partial \Psi}{\partial \alpha_p} > 0$

Under Assumption 3, higher ability individuals face a lower mental health penalty. Whether the motive to conceal increases or decreases with ability in this scenario will depend on the relative magnitude of $-\frac{\partial \Psi}{\partial \alpha_p}$ and $\frac{\partial \Lambda}{\partial \alpha_p}$. If the mental health penalty is sufficiently small and
the potential discrimination is sufficiently large, censoring could be observed in the top of
the ability distribution. However, if Assumption 4 holds, the attractiveness of concealment
unambiguously declines with ability level. This would generate censoring in the ability
distribution of true minority types, with only those of high ability level revealing their
type.

**Proposition 3.** Given structure of Proposition 1, and assuming that Assumption 4 holds
or that \(-\frac{\partial \psi}{\partial d_r} < \frac{\partial \lambda}{\partial d_r}\):

- \(Pr[\tau_p = T_p|\alpha_p] \geq Pr[\tau_p = T_p|\alpha'_p] \quad \forall \alpha_p > \alpha'_p\)

- \(\int \alpha_p \times 1[\tau_p = T_p|\alpha_p] d\alpha \geq \int \alpha_p d\alpha\)

If rather than random matching between \(\alpha_p\) and \(d_r\), the model was further relaxed to
allow \(\alpha_p\) and \(d_r\) to be negatively correlated, this would also generate censoring in both
observed discrimination levels and ability level in the minorities community. High ability
individuals would be relatively more likely to reveal their type and face the least amount
of discrimination, while low ability individuals would be relatively less likely to come out.
This would create the impression that minorities are affluent and empowered, in spite of
the fact minority status could be completely uncorrelated to ability and discriminatory
views might be highly prevalent.

This framework 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, discrimination tastes and productivity, the sign of
this bias can potentially 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

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5This could be motivated on the basis of observed correlates with socioeconomic status.
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 utilizes two sources of variation to explore 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 the fields of developmental psychology and microbiology. 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.

The second source of variation is a measure of the degree of discrimination or anti-gay attitudes in the county of birth of individuals. Information on the adoption of policies that impact the LGB community as well as the concentration of demographic groups that are known to oppose LBG rights are combined in a principle components analysis to generate a single discrimination index. The goal of this index is to identify respondents who were exposed to more and less discriminatory attitudes during their childhood. The exposure could be an indication of parental preferences, attitudes of peers or the general local attitude towards sexual minorities. The variation in exposure differential incentives to conceal. 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 location geocodes through an agreement with the Bureau for Labor Statistics. This data is one of the few instances in the United States where it is
possible to observe birth order information with sex of siblings identified, location of birth and extensive information on adult outcomes over the life-cycle. 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. 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 2. 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 Hypothesis) is that male-specific, Y-linked minor histcompatibility (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

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6The only other potential sources of sibship composition, geographic information and adult follow up were the ADD Health dataset which started in 1994 and the National Longitudinal Survey of Youth 1997. I choose to focus on the NLSY79 due to the greater amount of geographic variation as well as life-cycle information. In the NLSY79 I am able to track outcomes through age 45, whereas the corresponding maximum age in ADD Health is only 28 years old and for the NLSY79 is 24 years old.

7The majority of excluded cases were removed due to non-interview in 1993 rather than missing place of birth information.

8The 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.
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 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 with...
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 same-sex sexual 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 male 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.⁹

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 as a proxy to measure 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.

⁹The work presented in this paper can reconcile these conflicting results. Because of convenience sampling at universities or representative sampling from major U.S. cities, the FBO literature has been estimated off of a sample of individuals who are least likely to conceal. Out of the fact that they study individuals who live in the non-discriminatory areas, 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 individuals experiences same-sex attraction would be indistinguishable from heterosexual respondents.
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 to suffer more relative to men’s outcomes. This creates a positive bias in human capital accumulation.

4.3. County Index of Discrimination. The goal of this project is to study how minority individuals with the option of concealment respond to increasing costs of disclosure. To this end, I estimate an index of local discrimination based on the timing of adoption of various pieces of LGB-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 combined using principle component analysis, with the first factor representing cross-sectional variation in discrimination against sexual minorities across counties in the United States. Through focusing on how the correlation between the birth order proxy and individual outcomes changes across the spectrum of discriminatory background may help eliminate other confounding factors associated with birth order.

My measure of local discrimination is mapped onto individual observations based on their county of birth.\footnote{When 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.} If innate sexual preference is biologically determined, information about county of birth is unlikely to be correlated with underlying sexual preferences. County information should, however, provide a measure of the attitudes that parents, friends, employers and local communities have towards sexual minorities. Despite the fact that respondents may migrate away from these specific counties at later points in their
lives, the index will continue to measure the lasting affect of juvenile and adolescent exposure to discriminatory attitudes which might include the alienation of family and friends conditional on disclosure.

The variables that I use in the factor analysis are based on local adoption of public policies impacting the gay community as well as local characteristics that have been linked to homophobic attitudes in the literature. 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 relationships\textsuperscript{11}, the first year domestic partner benefits were offered from county government, the first year of hate 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 protections based on sexual orientation.\textsuperscript{12} 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 Campaign served as the foundation of this information. When the timing of adoption conflicted between sources, dates were verified directly with county statutes. Finally, there were many instances in which policies were adopted at both the county and state level. When the timing of these enactments varied, the earliest year of adoption was selected for the analysis.

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

\textsuperscript{11}This includes domestic partnership registries, civil unions and same-sex marriage.

\textsuperscript{12}These include credit, housing, union, education and public accommodation protections
vote share was gathered from the Congressional Quarterly’s *Voting and Elections Collection*.\(^{13}\) The per capita rate of religious adherents was estimated using the *Churches and Church Membership in the United States* collected by the Glenmary Research Center.\(^{14}\) All other variables were collected from the United States Census.

The results of the factor analysis are presented in Figure 3. This figure presents a mapping of the predicted first factor, which I interpret as an index of the discriminatory environment faced by the LGB community 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 gay men and women. In contrast, dark gray counties have negative index scores and are more antagonistic towards sexual minorities.

\(^{13}\)To focus on social conservative Republicanism, I average over Republican vote share in a county between 1992 and 2008
\(^{14}\)To minimize statistical noise in this data, I average over membership data from 1971, 1980, 1990 and 2000.
Regional trends are apparent; Southern and Midwestern states tend to have the least favorable climate towards gay men and women while New England and Western States tend to be more favorable. Inclusion of regional controls or state fixed effects will be an important consideration. Despite strong regional trends, however, I still observe a fair amount of within-state variation. Counties that include major metropolitan areas or college communities tend to be more favorable towards sexual minorities.

Figure 4 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 sexual minorities.

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. Since women’s sexuality does not respond to the number of her older brothers, this should allow us to identity the impacts of same-sex attraction and its interaction with increasing discrimination. This is summarized in the following equation.

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

In this equation, \(ob_i\) is the number of older brothers, \(m_i\) is sex is equal to male, and \(\iota_b\) is the index assigned according to county of birth. 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 in $X_i$. To absorb regional variation, I include state of birth fixed effects ($\tau_B$). Finally, standard errors are clustered at the county of birth ($b$) to address the fact that $\iota_b$ is constant within this level of geography.

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 coefficient 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.

There are clear advantages to performing an instrumental variable regression over the reduced-form specification outlined above. Instrumental variable analysis would scale the coefficients so that the magnitude of the effect on the affected population could be determined without relying on untested assumptions. However, this is not possible because the aim of this research is to study how concealment of underlying preferences impacts life-cycle behavior, and the variable I would instrument for is simply not observed in the data.

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,
Table 1. Robustness Check: Preexisting Parental Characteristics

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mom Age at Birth</th>
<th>Mom Educ.</th>
<th>Lived with Mom at 5</th>
<th>Mom Worked (Age 14)</th>
<th>Dad Age at Birth</th>
<th>Dad Educ.</th>
<th>Lived with Dad at 5</th>
<th>Dad Worked (Age 14)</th>
</tr>
</thead>
<tbody>
<tr>
<td># Older Brothers × Male</td>
<td>0.0584</td>
<td>-0.0834</td>
<td>0.00313</td>
<td>0.00411</td>
<td>0.00125</td>
<td>0.0837</td>
<td>0.0226</td>
<td>0.00399</td>
</tr>
<tr>
<td>× Index</td>
<td>(0.138)</td>
<td>(0.0775)</td>
<td>(0.00346)</td>
<td>(0.00495)</td>
<td>(0.0119)</td>
<td>(0.170)</td>
<td>(0.0986)</td>
<td>(0.00793)</td>
</tr>
<tr>
<td>Constant</td>
<td>25.18***</td>
<td>12.61***</td>
<td>0.958***</td>
<td>0.935***</td>
<td>0.662***</td>
<td>28.06***</td>
<td>13.20***</td>
<td>0.885***</td>
</tr>
<tr>
<td>(0.174)</td>
<td>(0.0889)</td>
<td>(0.00638)</td>
<td>(0.00760)</td>
<td>(0.0145)</td>
<td>(0.211)</td>
<td>(0.113)</td>
<td>(0.0101)</td>
<td>(0.0119)</td>
</tr>
<tr>
<td>Observations</td>
<td>8,046</td>
<td>8,296</td>
<td>8,485</td>
<td>8,487</td>
<td>8,788</td>
<td>8,327</td>
<td>7,479</td>
<td>8,478</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.371</td>
<td>0.111</td>
<td>0.008</td>
<td>0.005</td>
<td>0.023</td>
<td>0.304</td>
<td>0.116</td>
<td>0.005</td>
</tr>
</tbody>
</table>

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

Table 2. Robustness Check: Prepubescent Child Characteristics

<table>
<thead>
<tr>
<th>Variables</th>
<th>Attend Preschool</th>
<th>Foreign Lang. at Home</th>
<th>Shy at Age 6</th>
<th>Rec’d Magazines (Age 14)</th>
<th>Rec’d Newspaper (Age 14)</th>
<th>Library Card (Age 14)</th>
<th>HH in Urban Area (Age 14)</th>
</tr>
</thead>
<tbody>
<tr>
<td># Older Brothers × Male</td>
<td>0.00736</td>
<td>0.0110</td>
<td>-0.0145</td>
<td>0.00596</td>
<td>-0.0123</td>
<td>-0.0113</td>
<td>-0.00318</td>
</tr>
<tr>
<td>× Index</td>
<td>(0.0112)</td>
<td>(0.0101)</td>
<td>(0.0245)</td>
<td>(0.0117)</td>
<td>(0.0110)</td>
<td>(0.0110)</td>
<td>(0.00907)</td>
</tr>
<tr>
<td>Constant</td>
<td>0.303***</td>
<td>0.153***</td>
<td>-0.129***</td>
<td>0.746***</td>
<td>0.893***</td>
<td>0.822***</td>
<td>0.811***</td>
</tr>
<tr>
<td>(0.0142)</td>
<td>(0.0123)</td>
<td>(0.0311)</td>
<td>(0.0142)</td>
<td>(0.0125)</td>
<td>(0.0127)</td>
<td>(0.0114)</td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>8,639</td>
<td>8,991</td>
<td>8,692</td>
<td>8,943</td>
<td>8,965</td>
<td>8,958</td>
<td>8,995</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.005</td>
<td>0.066</td>
<td>0.011</td>
<td>0.056</td>
<td>0.038</td>
<td>0.051</td>
<td>0.044</td>
</tr>
</tbody>
</table>

Robust standard errors clustered at the county of birth level in parentheses; *** p<0.01, ** p<0.05, * p<0.1.
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 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 nondisclosure actually is present in my data. Second, given the concealment behavior, I want to document how this impacts lifecycle 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 gay. Figure 5 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, the remaining presence of a same-sex roommate is likely a better proxy for 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 respondents are older and 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. 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. Assuming that 5 percent of the male population is gay, 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.

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15Researchers have suggested the prevalence of homosexuality in the United States ranges between 2 percent and 10 percent of the overall population.
Before turning to other results, an additional source of downward bias needs to be addressed. Gay 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 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 triple interaction. This suggests that gay men 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 gay men 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 gay men 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
Table 3. Relationships and Family Formation

<table>
<thead>
<tr>
<th>Variable</th>
<th>18 to 24</th>
<th>25 to 30</th>
<th>31 to 37</th>
<th>38 to 45</th>
</tr>
</thead>
<tbody>
<tr>
<td># Older Brothers × Male × Index</td>
<td>Same-Sex, Unrelated Adult in Household Roster</td>
<td>0.00582</td>
<td>0.000363</td>
<td>0.00958**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.00468)</td>
<td>(0.00464)</td>
<td>(0.00387)</td>
</tr>
<tr>
<td>N</td>
<td>54,614</td>
<td>58,766</td>
<td>34,124</td>
<td>25,524</td>
</tr>
<tr>
<td># Older Brothers × Male × Index</td>
<td>Married</td>
<td>-0.00389</td>
<td>0.00315</td>
<td>0.00123</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.00911)</td>
<td>(0.0119)</td>
<td>(0.0127)</td>
</tr>
<tr>
<td>N</td>
<td>54,621</td>
<td>59,333</td>
<td>38,189</td>
<td>30,965</td>
</tr>
<tr>
<td># Older Brothers × Male × Index</td>
<td>Parented Any Children</td>
<td>-0.0178**</td>
<td>-0.00451</td>
<td>-0.0120</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.00891)</td>
<td>(0.0121)</td>
<td>(0.0128)</td>
</tr>
<tr>
<td>N</td>
<td>54,896</td>
<td>60,230</td>
<td>38,386</td>
<td>30,973</td>
</tr>
</tbody>
</table>

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

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.
Table 4. Migration

<table>
<thead>
<tr>
<th>Variable</th>
<th>Average Outcome in Age Range</th>
<th>Migrated from County from Age 14</th>
<th>Current Discrimination Index</th>
<th>Standardized Republican Vote Share</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>18 to 24</td>
<td>25 to 30</td>
<td>31 to 37</td>
<td>38 to 45</td>
</tr>
<tr>
<td># Older Brothers × Male × Index</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

Counts 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 results is that gay men opt to move to counties that are 1.74 standard deviations more favorable towards sexual minorities and about 2 standard deviations less likely to vote for Republican presidential candidates for each 1 standard deviation increase in the index based in their county of
birth. This consolidation of gay men in the least discriminating areas may help explain why large gay communities developed in a few isolated locations.

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 gay men 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

Table 5. Identity Investment

<table>
<thead>
<tr>
<th>Variable</th>
<th>Attends Religious Services Weekly&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Gender Ideology Score&lt;sup&gt;b&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td># Older Brothers × Male × Index</td>
<td>-0.0148&lt;sup&gt;*&lt;/sup&gt;</td>
<td>0.0189&lt;sup&gt;**&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>(0.00758)</td>
<td>(0.00846)</td>
</tr>
<tr>
<td>N</td>
<td>25,524</td>
<td>33,678</td>
</tr>
</tbody>
</table>

Robust standard errors clustered at the county of birth level in parentheses; *** p<0.01, ** p<0.05, * p<0.1.
<sup>a</sup>Religiosity was measured by the NLSY79 in 1979, 1982 and 2000.
<sup>b</sup>Gender ideology was measured by the NLSY79 in 1979, 1982, 1987 and 2004.
the “first stage”, these results indicate that gay men 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 gay men from discriminating counties are not concealing their identity, but instead simply cannot match to a partner. Men with more older brothers from conservative localities wait to move away from their home county until later in life and they move 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 to signal heterosexuality and social conservatism 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 theory in Section 3 suggests, minorities may opt to experience 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 the 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
Table 6. Mental Health: Rosenberg Self-Esteem Scale and Center for Epidemiological Studies Depression Scale (CES-D)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Overall</th>
<th>1980\textsuperscript{a}</th>
<th>1987\textsuperscript{a}</th>
<th>1992\textsuperscript{b}</th>
<th>1994\textsuperscript{b}</th>
<th>2006\textsuperscript{a}</th>
</tr>
</thead>
<tbody>
<tr>
<td># Older Brothers × Male × Index</td>
<td>0.0468**</td>
<td>0.0610**</td>
<td>0.0801***</td>
<td>0.0495*</td>
<td>0.0234</td>
<td>0.0383</td>
</tr>
<tr>
<td></td>
<td>(0.0185)</td>
<td>(0.0288)</td>
<td>(0.0307)</td>
<td>(0.0295)</td>
<td>(0.0292)</td>
<td>(0.0317)</td>
</tr>
<tr>
<td>N</td>
<td>45,441</td>
<td>8,593</td>
<td>8,390</td>
<td>8,759</td>
<td>8,713</td>
<td>7,205</td>
</tr>
</tbody>
</table>

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

\textsuperscript{a} Standardized Rosenberg Self-Esteem Scale

\textsuperscript{b} Standardized Center for Epidemiological Studies Depression Scale

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 gay men’s mental health improves by 2.06 standard deviations for each 1 standard deviation improvement in the index of their county of birth.\textsuperscript{16}

\textsuperscript{16}The 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 7. Mental Outlook: Rotter Locus of Control and Pearlin Mastery Scores

<table>
<thead>
<tr>
<th>Variable</th>
<th>Standardized Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Overall</td>
</tr>
<tr>
<td># Older Brothers × Male × Index</td>
<td>0.0313</td>
</tr>
<tr>
<td></td>
<td>(0.0212)</td>
</tr>
<tr>
<td>N</td>
<td>17,622</td>
</tr>
</tbody>
</table>

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

a Standardized Rotter Locus of Control Score
b Standardized Pearlin Mastery Score

The weakening statistical relationship over time could be the result of several factors. First, the sample size is decreasing in successive waves due to respondent attrition in the NLSY79. It could also be the case that changing attitudes towards the LGB community nationwide in the 1990’s and 2000’s improved mental health outcomes disproportionately for those from the most discriminatory backgrounds.

Two measures of mental outlook were also collected in the NLSY79. In 1979, respondents completed the Rotter Internal-External Locus of 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 δ<sub>1,t</sub> 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,” gay men experience a 1.37 standard deviation improvement on the mental outlook score for each 1 standard deviation increase in the birth county index.
Table 8. Alcohol Use Patterns

<table>
<thead>
<tr>
<th>Variable</th>
<th>Days Consumed 6+ Alcoholic Drinks</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td># Older Brothers × Male</td>
<td>-0.00190</td>
<td>-0.0289</td>
<td>-0.00760</td>
<td>-0.0658*</td>
</tr>
<tr>
<td>× Index</td>
<td>(0.0508)</td>
<td>(0.0462)</td>
<td>(0.0462)</td>
<td>(0.0340)</td>
</tr>
<tr>
<td>N</td>
<td>7,972</td>
<td>8,112</td>
<td>7,072</td>
<td>7,551</td>
</tr>
</tbody>
</table>

Experienced Aggressive Emotions while Consuming Alcohol

|                               | 1984                              | 1985  | 1988  |
| # Older Brothers × Male       | -0.0331***                        | -0.0234** | -0.00595 |
| × Index                       | (0.0108)                          | (0.00967) | (0.0100) |
| N                             | 8,268                             | 8,712  | 8,113  |

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

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.

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
Table 9. AFQT Score and Educational Attainment

<table>
<thead>
<tr>
<th>Variable</th>
<th>AFQT Score</th>
<th>Years of Schooling</th>
<th>Graduate College</th>
</tr>
</thead>
<tbody>
<tr>
<td># Older Brothers × Male × Index</td>
<td>0.0479**</td>
<td>0.0651***</td>
<td>0.0258**</td>
</tr>
<tr>
<td></td>
<td>(0.0240)</td>
<td>(0.0248)</td>
<td>(0.0110)</td>
</tr>
<tr>
<td>N</td>
<td>8,561</td>
<td>8,990</td>
<td>8,990</td>
</tr>
</tbody>
</table>

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

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 a 1 standard deviation change in birth county index among gay men. Probability of college graduation increases by 113 percent points. These exceedingly large magnitudes may be exaggerated by a conservative estimate of partnership rates for gay men 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 attainment, however, no significant effects are observed in earlier years. This
may reflect wage penalties from market discrimination for gay men 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, current estimates likely underestimate the true distribution of discrimination faced by the lesbian and gay community in the United States, and second, focusing purely on labor market outcomes can fail to capture the broader dynamics at work. To support these conclusions, I present evidence that same-sex cohabitation, mobility and identity investments respond to increasing discrimination risks. The concealment behavior is linked with negative impacts on the mental health of respondents and educational attainment. Income and career progress, however, show weaker correlations 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 observed negative mental health outcomes and substance abuse patterns raise the potential for substantial negative externalities.

The results show the first plausible evidence for men who experience same-sex attraction but never act on or self-identify these feelings. Because the natural rate of homosexuality is highly contested, it is hard to know the true reach of this phenomenon. But, given the large negative impacts associated with concealment, even a small prevalence rate could have significant implications especially if it is geographically concentrated.

This work suggests the importance of continuing to incorporate sexual orientation into public policy initiatives, particularly anti-discrimination legislation. Providing protections for the lesbian and gay community may help reduce the costs of discrimination and decrease rates of concealment. Given that many gay 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 gay men and women as these individuals potentially transition out of concealment and disrupt the family unit.


M. Bertrand and S. Mullainathan. Are Emily and Greg more employable than Lakisha and Jamal? a field experiment on labor market discriminations. *American Economic Review*,


http://psp.sagepub.com/content/28/6/815.abstract.


