Veiling

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Abstract

Veiling among Muslim women is modeled as a form of cultural resistance which helps to retain religious values and signals unobservable behavior to one’s community. Our theory predicts that veiling is highest when individuals from highly religious communities interact in highly secular environments. This accounts for puzzling features of the new veiling movement since the 1970s. Though veiling inhibits the transmission of secular values, we show that bans on veiling aimed at assimilation can be counterproductive. By inducing religious types to segregate in local communities, bans on veiling can lead to increased religiosity.

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One recent phenomenon incomprehensible to many observers of the Egyptian scene today is the visible presence of a new Egyptian woman: the young urban college student on her way to or from the university campus – carrying her books, wearing eye glasses, alone or in the chatting company of other college women, and completely “veiled” – face and body.

(El Guindi 1981)

1 Introduction

The rise in veiling among Muslim women since the 1970s has made veiling a focal point for debate about religion and multiculturalism. By veiling we mean the various types of headcovering and modest forms of dress worn by Muslim women. Consider accounts of Cairo in 1969: “Almost no women are veiled” (Abu-Lughod 1971, p. 239). A visitor to the city in 2000 would have encountered a very different scene: “a staggering majority of over 80 percent” of Cairene women wear some form of veil (Bayat 2007). This pattern has been repeated in countries such as Turkey (Rheault 2008), Indonesia (Smith-Hefner 2007), Pakistan (Afzal-Khan 2007) and Tunisia (Waltz 1986), as well as among Muslim minorities in Europe and the United States.¹ There are several puzzling features of the new veiling movement. In many countries, the movement reverses previous trends toward deveiling and appears to have originated among urban, educated, working, middle-class women (e.g. El Guindi 1981, Hoodfar 1991, Mule & Barthel 1992, Smith-Hefner 2007). This paper introduces the new veiling movement to the economics of identity literature (Akerlof & Kranton 2010, Austen-Smith & Fryer 2005, Fang & Loury 2005), which includes work on related phenomena such as “acting white” among African Americans.

Veiling impacts upon women’s educational and labor market choices and is a major public policy issue.² Various bans on veiling have been imposed at times in Turkey, Iran, Indonesia and Tunisia. In 2004, France introduced bans on the Muslim headscarf in public schools. Recently, bans on full face veils have been imposed in Belgium and France and there have been political moves to further restrict veiling in the Netherlands, Denmark, Italy, Switzerland and Egypt (e.g. Bremner 2010). Why is the way in which...

¹The new veiling movement is part of the broader rise in religious commitment among Muslims known as the Islamic revival. See Hunter (1988), Esposito (1999), Lapidus (2002), Bayat (2007) and Carvalho (2009).

²For example, veiled women are routinely screened out by foreign firms and employers in lucrative fields such as televised media, hospitality and tourism, in predominantly Muslim societies such as Egypt, Turkey, Lebanon and Indonesia (Mule & Barthel 1992, Brenner 1996, Blaydes & Linzer 2008). See also Meyersson (2010).
women clothe themselves the subject of such intense political interest? The political interest in veiling has not been matched by an understanding of why women veil.

In this paper, we provide what is, to the best of our knowledge, the first formal theory of veiling. Modern behavioral economics and game theory have economists well placed to study issues of identity, such as veiling. We address two questions: Why has there been a surge in veiling since the 1970s, particularly among educated, middle-class women? What are the possible implications of bans on veiling?

Our theory is based on the notion that expressing one’s values through (social) identity reinforces one’s values. In particular, we assume that veiling makes an agent less susceptible to acquiring secular values and engaging in religiously prohibited behavior. Consequently, social identity serves as a signal to one’s community of unobservable traits and behavior. “The veil keeps us [Muslim women] from getting mixed up in American culture” (Read & Bartkowski 2000, p. 407) is one function of veiling identified in interviews with veiled women. In our framework, veiling is a signal of cultural resistance to acquiring secular values.

To motivate our approach, consider the following situation: A young woman enters university outside of her hometown. There, she is likely to face an environment in which she is exposed to values and modes of behavior that are different to those prevailing in her community. Moreover, members of her community know that she may be influenced to adopt these values/behavior. The woman may care about their opinions for a variety of reasons (e.g. social esteem, social insurance, marriage market). Hence, when attempting to retain her existing values, she will need to do so in a way that is visible to her community. We propose that adopting a public religious identity, by veiling, enables her to both resist secular values and religiously prohibited behavior (e.g. mixing of sexes, drinking, attending bars etc.), and signal her unobservable values/behavior to her community. This suggests one possible explanation for the prominent role of urban, educated, working women (who face greater exposure to secular values) in the new veiling movement.

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3 The closest paper in this respect is by Horst et al. (2007). In their model, agents attempt to conform to their desired self-image by joining groups which embody their desired traits. Unlike Akerlof and Kranton’s (2000) approach, in which social identity is a form of consumption, an individual’s traits are endogenous (i.e. shaped by social identity) in our approach, so that social identity is productive. We motivate the assumption that veiling helps an agent to retain religious values in section 3.1.1 and Appendix B.

4 Bisin et al. (2010) develop and test an alternative ‘cultural distinction’ theory of ethnic identity in which members of a minority use marriage and identity choices to help them cope with negative social interactions with the majority group.
To model veiling, we begin with a cultural transmission framework familiar to economists. Building upon work by Bisin and Verdier (2000, 2001), we assume that agents acquire religious or secular values through social contact, and that they are not passive in this process. In our model, agents use social identity choice to influence the transmission of cultural values. As we shall see, our analysis applies whether it is the agent herself who chooses her degree of veiling or whether veiling is chosen for her by a parent. Together, an agent’s environment and identity determine her values/behavior.

Our approach is related to Akerlof and Kranton’s seminal work on the economics of identity (Akerlof & Kranton 2000, 2002, 2005, 2010). In their framework, agents place themselves in a social category, possibly by adopting a marker such as veiling. Social categories are associated with different ideals for behavior, and agents try to conform to the ideal behavior associated with their social category. Our main assumption, that adopting a religious identity (i.e. veiling) makes one less likely to engage in religiously prohibited behavior, accords with this key feature of their framework. In both models, different types of agents sort into different identities. The main departure in our model is that an agent’s type (i.e. their values) is endogenous and this has important implications for identity choice.

The cultural transmission framework alone, however, fails to account for certain features of veiling, including the pressure to veil faced by secular types in highly religious communities, which is an important part of the debate over bans on veiling (see Kuran 1995, p. 8-9, 16). Indeed, interviews with veiled women reveal a concern for the opinions of family, friends and community members (e.g. Brenner 1996, Smith-Hefner 2007, Omkar 2007). This motivates our move to a richer model which combines social influence with cultural transmission. When introducing social influence to our particular context, we need to develop an alternative (but complementary) model to standard increasing-

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5 Models of cultural transmission were originally developed by Cavalli-Sforza & Feldman (1981) and Boyd & Richerson (1985, 2005). Bisin & Verdier (2000, 2001) were the first to introduce scope for choice in models of cultural transmission, where parents can choose to socialize their children to retain certain cultural traits. For an alternative though related model of cultural transmission, see Corneo & Jeanne (2009).

6 Throughout the paper, we make the distinction between religious and secular values. These terms are open to a wide range of interpretations, but we could not locate a better terminology. To be precise, what we mean by this distinction is differences in attitudes toward appropriate behavior for women, especially when it comes to gender roles and interactions with the opposite sex. We do not mean differences in political values, attitudes toward technology etc. In their analysis of World Values Survey data, Norris & Inglehart (2004) conclude that “the basic cultural fault line between the West and Islam does not concern democracy – it involves issues of gender equality and sexual liberalization” [p. 155].

7 For example, Smith-Hefner (2007) reports that, “Those who do not veil describe themselves as “not yet ready” to commit to the weighty ethical standards and behavioral restrictions of veiling” [p. 400].
returns/tipping-point models of social influence (e.g. Schelling 1978, Kuran 1995, 1998), which have proved useful in a wide range of settings. If the pressure to veil were based upon the degree of veiling by others in one’s environment, then we would expect less veiling in more secular environments. This is at odds with the prominent role of educated, working, middle-class women in the new veiling movement.

Instead of a behavior-dependent model of social influence of this kind, we develop a type-dependent model in which an individual cares about the opinions of members of her community, even when these opinions proceed from different values to her own. The greater the prevalence of religious types in the community, the more heavily religious values weigh in community opinions, and the greater the pressure to veil in order to resist religiously prohibited behavior. This leads to a social signaling model with a difference: unlike standard models that assume a ‘universally ideal’ type, the type of person one wants to be depends on the social context.8 In more religious (resp. secular) communities, agents want to signal that they are and are likely to remain a religious (resp. secular) type. Hence we can study how signaling through identity choice varies with the social context.

Our theory provides a unified framework for understanding certain patterns of veiling in predominantly Muslim and non-Muslim societies.9 The critical factor turns out to be the dislocation between the environment which influences an agent’s values and the community whose opinions she cares about. The main testable prediction of our theory is that veiling is highest among women from highly religious communities who interact in highly secular environments. This is one possible explanation for why the new veiling movement originated with urban, educated, working, middle-class women, especially those from traditional rural backgrounds (MacLeod 1991). In particular, we suggest that the new veiling movement may be related to migration from rural areas and towns to large cities – both in predominantly Muslim societies, as well as the United States and Europe – where people are exposed to more liberal mores and opportunities for religiously prohibited behavior. An associated trend is the influx of women into formal education and employment, which has led to breakdown of the customary segregation of the sexes.

8For example, in standard models, one wants to be a high ability type (Spence 1973), a wealthy type (Bagwell & Bernheim 1996), an altruistic type (Levine 1998) or a sociable type (Austen-Smith & Fryer 2005), regardless of the distribution of types in the economy.

9The new veiling movement is a complex phenomenon and we cannot possibly capture every possible motivation for veiling in a single model. Whereas historical and anthropological work attempts to capture the full richness of the movement, we commit to one fully-specified explanation that is sufficient to explain a rise in veiling among educated, middle-class women. Our analysis yields distinct and testable predictions that could guide future empirical work.
Veiling enables them to resist the secular values/behavior with which they come into contact, and which meet with disapproval in their communities.

The function of veiling to preserve religious values leads to a complex interactive process in which values determine social identity, which in turn feeds back into values. The full dynamic version of our model, in which values and identity coevolve, is used to analyze the implications of bans on veiling. The view of veiling as a form of resistance to acquiring secular values makes it unsurprising that those favoring the cultural assimilation of religious minorities seek to prohibit veiling. However, we demonstrate that bans on veiling aimed at cultural assimilation can be self defeating, when we allow agents to choose to segregate by interacting only in their community, rather than taking up study/work in a more secular environment. If the return to integration is low (e.g. low wages, low returns to education, high discrimination) relative to the personal and reputational costs of deveiling, then a ban on veiling induces agents to segregate in their local community as a (costly) substitute for veiling. Thus, if segregation further reduces exposure to secular values, then a ban on veiling inhibits the transmission of secular values. Of course, the right policy on veiling is a broader matter of justice, well beyond the scope of this paper. But our framework does suggest that a ban on veiling aimed at cultural assimilation could be counterproductive.

Our model can be extended to analyze how veiling influences a woman’s decision to take up higher education and formal employment (something we briefly explore in section 6.2). In particular, veiling can be viewed as a strategy for (limited) integration, which enables women to take up economic opportunities outside the community while maintaining their reputation within the community. Rather than further pursuing these issues, however, we focus in this paper on providing a basic framework for analyzing veiling, which will hopefully support future theoretical and empirical work on the educational, labor market and organizational consequences of veiling. Moreover, we believe our model of identity formation has applications beyond veiling. Many economic decisions affect our future preferences and signal something about ourselves to others, from choice of schools, residential neighborhoods, and occupations, to religious and political affiliations, from how we dress to whom we marry. Akerlof and Kranton (2010) end their recent book by raising several outstanding issues: “Where do norms and identity come from? How do they change and evolve?” By analyzing the coevolution of values, norms and identity, we take a small step toward addressing these key questions for the economics of identity.

The remainder of the paper is structured as follows. In section 2, we briefly review the
historical origins of veiling, identify patterns of contemporary veiling that require explanation and discuss why possible alternative theories do not account for these facts. In sections 3 and 4, we introduce the cultural transmission and social influence components of our model in turn, and analyze equilibrium veiling. In section 5, we conduct the comparative statics analysis, which leads to an account of some factors behind the new veiling movement. In section 6, we complete the dynamic analysis and study the consequences of veiling bans in light of our theory. Section 7 concludes.

2 Veiling

Veiling refers to the various types of headcovering and modest forms of dress worn by Muslim women (Esposito 2004). The forms of veiling adopted today include the chador which is the semi-circle of fabric Iranian women wear wrapped around their heads and bodies in public spaces, the jilbab which is a concealing coat, the khimar which is a sheer headscarf or wrap, the niqab which is the face veil commonly worn in the Persian Gulf states, and the burqa associated with Afghanistan which covers the entire head and body, usually with an area of mesh around the eyes. While the term hijab is often used in reference to one of the many ways a scarf or cloth can be used to cover the hair, we shall adopt the broader notion of the terms “hijab” and “veiling” in this paper, as an overall standard of dress which symbolizes “modesty, privacy, and morality” (Esposito 2004).

To motivate veiling as a religious duty, many Muslims cite Qur’anic passages that instruct women to “be modest in thy bearing” (verse 31; 19). In particular, Surah an-Nur ayah 31 of the Qur’an refers to headcovering as a form of modesty:

And say to the believing women that they cast down their looks and guard their private parts and do not display their ornaments except what appears thereof, and let them wear their head-coverings (khimar) over their bosoms, and do not display their ornaments... and let them not strike their feet so that what they hide of their ornaments may be known; and turn to Allah all of you, O believers! so that you may be successful.

In further Qur’anic passages, Muslims are instructed, “Tell your wives and daughters and the believing women that they should cast their outer garments (jilbab) over themselves, that is more convenient that they be known and not molested,” while men are required to speak to the wives of the prophet from behind a screen (hijab) to ensure “greater purity for your hearts and for them” (Sherif 1987, p. 155).
2.1 Contemporary Veiling

Despite the static nature of scriptural injunctions to veil, norms of veiling have been subject to substantial change over the twentieth century. In this section, we describe the contemporary rise in veiling among Muslim women and identify some features of this new veiling movement that a theory of veiling needs to explain. To our knowledge, there do not exist any hard statistical data on patterns of veiling among Muslim women. We proceed on the basis of extant ethnographic, historical and survey-based studies of veiling.¹⁰

2.1.1 The New Veiling Movement

The first half of the twentieth century witnessed a retreat from traditional religious practices in many Muslim societies. By the 1930s, the educated elite had begun to adopt Western modes of lifestyle and behavior incompatible with *sharia*; prayers and fasting were less frequently observed, and the consumption of alcohol was rising (Hourani 2005, p. 345-6). The veil was also vanishing in public. Veiling was first abandoned by non-Muslim minorities in the Middle East during the 19th century. In Beirut, Christian women had ceased veiling by 1890 (Stillman 2003). Muslim women began this process later and more gradually. Modest standards of European dress were first adopted, including European-style face veils, as a transition from traditional norms of dress to Western fashion (Stillman 2003).

In 1923, an upper-class Egyptian woman named Huda Shaarawi publicly removed her face veil, upon returning from an international meeting of feminists (Shaarawi & Badran 1987). This initiated a deveiling movement, featuring organized marches by unveiled women in the streets of Cairo.¹¹ It culminated in the almost universal adoption of Western modes of dress by Egyptian women of the middle and upper classes. By 1971, most Cairene women wore:

a straight, dark gabardine skirt ending just below the knee and over it a shirt in a floral or geometric pattern with an open collar and sleeves just above the elbow.

(Soueif 2001)

Indeed, Janet Abu-Lughod (1971) writes of public life in Cairo at that time: “One rarely sees *jalabiyyah* (plural of *jilbab*)... Almost no women are veiled” [p. 239]. Since the

¹⁰Akerlof and Kranton’s (2010) work is also motivated by ethnographic evidence, and they justify this approach on p. 116-117.

¹¹Unlike in Iran, Turkey and Indonesia, the movement was led by women activists and without resort to the state apparatus (Hoodfar 1991).
1970s, however, there has been a dramatic surge in veiling among Muslim women, both
in predominantly Muslim societies and in immigrant communities in Europe and the
United States. In Egypt, veiling increased among university students in the early 1970s,
and had by the end of the decade become a widespread movement among the lower middle
classes, especially women employed in white-collar positions in the state sector (Hoodfar
1991). By 2001, a visitor to Cairo would have noticed:

the straight gabardine skirt is now just above the ankles, the patterned shirt is
longer, and now has long sleeves. The head is covered with a scarf folded into a
large, concealing triangle. This has become the “default” dress. (Souef 2001)

Conducting a set of informal surveys in public spaces, Bayat (2007) claims that in 2000
veiled women in Cairo constituted “a staggering majority of over 80 percent.” This is a
far cry from the Cairo of 1969 in which “almost no women are veiled.”

Similarly, veiling was rarely seen in many parts of Turkey during the 1970s (see Breu
& Marchese 2000), where the religious headcovering had been prohibited in public uni-
versities and Turkish government institutions since 1924. Yet, prior to the repeal of the
prohibition in 2008, 45 percent of Turkish women surveyed in a Gallup Poll reported
wearing the headscarf in public (Rheault 2008). In Indonesia, Smith-Hefner (2007) esti-
mates that the percentage of the Muslim female student population wearing an Islamic
headcovering on campus in the nation’s oldest and second-largest university rose from
less than three percent in the late 1970s to more than 60 percent by 2002.12

The rise in veiling in the United States and Europe seems to have begun in the 1990s
among second and third generation Muslim immigrants (e.g. Alvi et al. 2003, Ali 2005). In
a survey of Muslim women in the mid-1980s, Haddad & Lummis (1987) report that “few
if any Muslims born in the U.S. wear hijab (headcovering) or jilbab, and most migrants
who came wearing such conservative clothing gradually change to more typical American
style clothing” [p. 132]. In contrast, 36 percent of American Muslims surveyed in a 2002
poll wear a religious headcovering daily; only half of respondents never wear a form of
headcovering (Hamilton College 2002). A 2006 Pew Global Attitudes Poll reports that 53
percent of female Muslim respondents in Great Britain, 45 percent in Spain, 44 percent in
Germany and 13 percent in France wear a headscarf every day (Morin & Horowitz 2006).

Only in France do a majority of Muslim women (73%) report never wearing any form
of veil. A resurgence in veiling is evidenced by inter-generational differences in attitudes
among Muslims. In a 2006 survey of 1,003 Muslims conducted by Populus, the largest

12In Java, we cannot speak of a ‘revival’ in veiling, since veiling in many parts of Java was until
recently quite limited (Brenner 1996).
inter-generational difference between British Muslims centers on veiling: 74 percent of respondents aged 16-26 prefer Muslim women to wear the Islamic headcovering, compared to only 28 percent of British Muslims over 55 years old (Mirza et al. 2007).

2.1.2 Patterns of Veiling

We shall now set out two features of the new veiling movement which should be part of an explanation.

*Timing & Character.* The new veiling movement refers to the surge in veiling among Muslim women since the 1970s. Hoodfar (1991) writes, “The modern veil is a style of dress very different from clothing worn by more traditional *balady* (urban lower classes) or *felaheen* (peasant) women” [p. 112]. It can be described as a new standard of dress – a product of modernization – which incorporates only certain elements of older, regionally distinct styles (Stillman 2003). Thus, contemporary veiling is not a longstanding custom, but a large-scale innovation which requires explanation.

*Demographics.* In many countries, the new veiling movement appears to have originated among urban, educated, middle-class women who work outside the home (e.g. El Guindi 1981, Hoodfar 1991, Mule & Barthel 1992, Smith-Hefner 2007). For example, in Egypt, the movement began in universities and is pronounced among women occupying (lower-level) white-collar public sector jobs. MacLeod (1991) writes: “Voluntary support of the new veiling, by educated, working women, part of the modernizing middle classes, presents a paradox, for why would women who are already on the path to modernized life choose to resurrect a symbol which seems to portray and encourage their subordination?” [p. 4].

2.2 Theories of Veiling

We shall now review five possible theories of veiling. Marriage market motivations for veiling are discussed in section 5.2, in light of our model. Each of the theories, we argue, either fails to explain an important fact about contemporary patterns of veiling or is incompletely specified in an important way. This makes explaining the new veiling movement a genuine challenge for applied theory.

The following statement is representative, “I realized that it was fard (religious duty) and I wanted to obey Allah’s commands” (Ali 2005, p. 517). This leaves unanswered several questions: Why did educated, middle-class women suddenly recognize that veiling is a religious duty? Why is veiling a religious duty in the first place? In 1937, the Fatwa Committee of Al-Azhar, the premier institution of Sunni Islamic higher learning, declared that veiling is not a religious obligation. This seems to be a codification of the informal norms of women’s dress which had emerged by that time (Stillman 2003, p. 156). Hence what is deemed to be a religious obligation seems to vary with the social context, and we believe that this should be part of an explanation of the new veiling movement.

2. Increasing Returns/Tipping Points. If the pressure to veil were increasing in the degree of veiling by others in one’s environment, as suggested by increasing-returns/tipping-point theories (e.g. Schelling 1978a, Kuran 1995, 1998), then we should expect less veiling in more secular environments. Hence, this behavior-dependent form of social influence is inconsistent with the adoption of veiling by women choosing to study and work outside the home, where they are exposed to representations/norms that are inconsonant with their decision to veil. Kuran (1998) develops a model in which one’s reference group is limited to one’s ethnic community and the pressure to engage in ethnically significant activities (such as veiling) increases with the degree of community participation in these activities. This leads to an illuminating account of ethnic identification and conflict in general, but it does not explain the prominent role of educated, working, middle-class women in the new veiling movement. We develop a type-dependent model of social influence in which communities recognize that interactions outside the home expose an agent to secular values, which can be resisted through veiling.

3. Protection. Veiling can be a strategy adopted by women to regulate interactions with men and expand their autonomy in a patriarchal society (see MacLeod 1991, Mule & Barthel 1992). Public spaces such as streets, cafes and buses are viewed in many Muslim societies as the domain of men (El Guindi 1981, Mernissi 1987). Women who intrude into the public domain are often subject to verbal and physical harassment. According to Smith-Hefner (2007), veiling “offers a significant symbolic defense against unwelcome male advances while nonetheless allowing young women to enjoy their freedom of movement” [p. 401].

The new veiling movement, however, extends to Muslim minorities in Europe.
and the United States, where veiling can invite, not deter, physical and verbal harassment when moving around in mainstream society. Our aim is to provide a unified theory of veiling in Muslim and non-Muslim societies.

4. Religious Club Goods. The club goods theory introduced by Iannaccone (1992) proposes that religious groups impose behavioral restrictions to provide for more efficient provision of religious club goods. Behavioral restrictions ameliorate the free-rider problem in collective production by stigmatizing members in the society at large. This induces existing members to shift resources away from secular activity and screens out uncommitted members. There are several issues that arise when applying this theory to veiling.\textsuperscript{14} Firstly, many veiled women are not members of a religious group. Secondly, the religious club goods theory seems to be at odds with the educational and labor market participation of veiled women. Today, veiled women are a familiar sight in public spaces in Muslim and non-Muslim societies. Rather than limiting the overall secular activity of religious group members, we propose that veiling is a targeted commitment to refrain from religiously prohibited behavior, which enables a woman to interact outside the monitoring range of her community while maintaining her reputation for virtue.\textsuperscript{15} Religious groups might provide veiled women access to club goods not to encourage efficient group production, but to reward behavior that upholds religious standards in a secular environment.

5. Oppositional Identity. Bisin et al. (2010) develop a model in which members of an ethnic/religious minority bear a psychological cost from interacting with members of the majority group. They propose that individuals can better cope with this cost of interethnic contact by differentiating themselves further through ethnic identification.\textsuperscript{16} Bisin et al. provide empirical evidence supporting this cultural distinction hypothesis. In particular, self-reported measures of ethnic identity are higher in mixed than segregated neighborhoods. While coping with negative social interactions through oppositional ethnic identity may contribute to an explanation of ethnic identification among Muslim immigrants, we believe that our theory of cultural resistance has greater explanatory power that respect to the unveiled girls\textsuperscript{15} [p. 405].

\textsuperscript{14}Indeed, this theoretical framework has not been specifically applied to veiling. For an application of the club goods theory to communal Qur'an study and Islamic school attendance, see Chen (2010). Berman (2000) applies the religious club goods model to explain patterns of behavior among Ultra-Orthodox Jews.

\textsuperscript{15}For example, one of Omkar's (2007) respondents recounts how their parents “were fine with my going to uni because they know that dressed like this I can’t get into trouble. It’s not like I’ll go clubbing or drinking with men” [p. 79].

\textsuperscript{16}Benabou & Tirole (2010) develop a model of oppositional identity in which agents infer their deep values from past actions. In their model, agents may fail to take up new economic opportunities, because this communicates negative information about the value they place on a traditional lifestyle (which they may have to fall back upon) to their future selves.
when it comes to veiling in particular. Cultural distinction motives should apply to men and women alike. However, veiling is far more prevalent among Muslim women than equivalent forms of identification are among men (e.g. beard, traditional robe). Clearly, veiling has something to do with the way moral standards are applied to women.\footnote{Bayat (2007) claims that men “are not subject to the same standards of sin and guilt as women”: “While both Muslim men and women might appear half-naked on beaches, only the women would be considered immoral. Only a woman’s uncovered hair, not a man’s, provokes moral pressure” [p. 158].}

3 A Model of Veiling

In this section, we introduce and analyze the cultural transmission component of our model, before incorporating social influence into the analysis in section 4. We introduce the notion that expressing one’s religious values through veiling reinforces these values. This leads to a model in which veiling acts as a form of \textit{cultural resistance} by reducing the probability that an agent acquires secular values and violates religious standards of behavior. Our analysis begins with a one-shot game, which is sufficient to generate a possible explanation for the new veiling movement. Analysis of the recurrent game is conducted in section 6.

3.1 The Model

\textit{Types.} Consider an agent $i$ drawn from community $I$, which is a continuum of agents with unit mass. The agent is endowed with cultural values, where $i = r$ denotes religious values and $i = s$ denotes secular values. [We are abusing notation by denoting both types and individuals by $i$.] For now, fix the \textit{proportion of agents in the community with religious values} at the beginning of the period at $q \in (0, 1)$. An agent’s type is private information, but the proportion of religious types $q$ is common knowledge.

Social interactions take place over three dates and are depicted by Figure 1:

\textit{Identity.} At date 0, agent $i$ observes her type and chooses a degree of veiling. Rather than analyzing the choice between discrete forms of headcovering (headscarf, \textit{chador}, \textit{niqab} etc.), we model veiling as a continuous variable $v_i \in [0, 1]$ which reflects the overall modesty of a woman’s appearance (Esposito 2004). Empirically, there is gradation in headcoverings and overall dress (see El Guindi 1981, p.474-5).

\textit{Cultural Transmission.} At date 1, agent $i$ enters a \textit{cultural transmission phase} with prob-
ability $\alpha \in (0, 1)$. If this occurs, she acquires secular values with probability $pg(v)$ and religious values with complementary probability $1 - pg(v)$, where $g$ is strictly decreasing in $v$ (our main assumption, motivated below) and $p$ is a constant between zero and one. If she does not enter a cultural transmission phase, then she retains her date-0 type. We assume that $g$ is a convex function of $v$, $g(v) \in [0, 1]$ and $g'$ is bounded from below. For example, the affine function $(1 - v)$ satisfies all of these conditions.

Behavior. At date 2, agent $i$ observes her updated type and chooses an action denoted by $x \in \{r, s\}$. A religious type chooses action $r$ and a secular type chooses action $s$ (i.e. types and actions are synonymous). Action $s$ is interpreted as behavior that is religiously prohibited (e.g. mixing with opposite sex, drinking, attending bars). We shall assume that taking $x = s$ is costly from the perspective of an agent who has religious values at date 0. Payoffs are formally specified below.

The structure of the game is assumed to be common knowledge.

3.1.1 Interpretations & Motivations

There are several types of social interactions that fit this basic framework. We discuss these in Appendix A. In each case, the parameter $p$ determines an agent’s exposure to secular values/behaviour. Hence, we shall refer to $p$ as the degree to which the environment
is secular, throughout the paper. In Appendix B, we motivate the main assumption in the paper, that veiling reduces the probability that an agent acquires secular values, i.e. \( g'(v) < 0 \). In essence, we propose that veiling could (i) increase cognitive dissonance from engaging in religiously prohibited behavior, and/or (ii) reduce an agent’s exposure to secular values by segregating her from secular people and opportunities for religiously prohibited behavior. In section 6.2, we examine the case in which agents can choose their environment as well as their social identity. This additional choice has implications for bans on veiling.

3.1.2 Agency

Choice in our model can be given a planner-doer interpretation which is familiar in behavioral economics (Schelling 1978b, Thaler & Shefrin 1981): veiling at date 0 is chosen by a (farsighted) planner, while behavior at date 2 is chosen by a (myopic) doer. There is no reason why these two selves need to reside in the same individual. For example, the veiling decision at date 0 could be made by parents attempting to shape their child’s values and choice of behavior at date 2. Veiling could hence be viewed as a form of cultural resistance by parents, seeking to minimize the likelihood that their children acquire secular values. For expositional ease, we shall not emphasize this alternative interpretation in the paper. But the reader may keep in mind that our model encompasses both voluntary veiling and veiling imposed by the household.

3.2 Veiling without Social Payoffs

Let us begin by analyzing veiling in the absence of social payoffs, i.e. when agents do not care about the opinions of others.

Consider an agent choosing between action \( x \in \{r, s\} \), where \( r \) is religious behavior and \( s \) is religiously prohibited behavior. Denote the payoff to an agent who begins the period as type \( i \) and who ends up taking action \( x \) by \( z_{ix} \). A date-0 agent has “imperfect empathy” toward her date-2 self (Bisin & Verdier 2001), in that she evaluates her date-2 action from the perspective of her date-0 values. An agent who acquires new values via cultural transmission at date 1 experiences a loss, because she will disapprove of her action at date 2 from the perspective of her date-0 values. [Henceforth, when we refer to an agent’s type, we mean her initial values \( i \in \{r, s\} \).] In particular, \( z_{ii} > z_{ix} \) for \( x \neq i \), so that a religious type would prefer to engage in religious behavior \( x = r \) and a secular type would
prefer to engage in secular behavior \( x = s \).

Agents use veiling to influence cultural transmission probabilities. In doing so, they bear a (direct) cost of veiling denoted by \( c(v) \), which reflects concerns such as discomfort and discrimination. In predominantly Muslim societies, such as Egypt, Turkey, Lebanon and Indonesia, veiled women are routinely screened out by foreign firms and employers in lucrative fields such as televised media, hospitality and tourism (Mule & Barthel 1992, Brenner 1996, Blaydes & Linzer 2008). In non-Muslim societies, veiled women are increasingly the subject of verbal/physical harassment (e.g. Ali 2005, Read & Bartkowski 2000, Omkar 2007). We assume that \( c \) is strictly increasing and strictly convex in \( v \).\(^{18}\) In addition, to ensure interior veiling equilibria, we assume \( c'(0) = 0 \) and \( \lim_{v \to 1} c'(v) = \lim_{v \to 1} c(v) = \infty \).

Consider an agent who begins the period as type \( i \). When she chooses her degree of veiling \( v \) at date 0, her expected payoff (in the absence of social payoffs) is:

\[
u_i(v) = \alpha pg(v)z_{is} + \alpha(1 - pg(v))z_{ir} + (1 - \alpha)z_{ii} - c(v). \tag{1}\]

For an agent who begins the period as religious \( i = r \), the payoff in (1) can be expressed as:

\[
u_r(v) = z_{rr} - \alpha pg(v)[z_{rr} - z_{rs}] - c(v) \\
\equiv z_{rr} - \alpha pg(v)\lambda_r - c(v), \tag{2}\]

where we have defined \( z_{rr} - z_{rs} \equiv \lambda_r > 0 \) as the cost of engaging in religiously prohibited behavior for a religious type. We shall henceforth refer to \( \lambda_r \) as the intensity of disapproval by religious types. Thus, religious types experience an expected loss of \( \alpha pg(v)\lambda_r \) from acquiring secular values and engaging in religiously prohibited behavior. As \( g(v) \) is strictly decreasing in \( v \), veiling serves to mitigate this expected loss by reducing the probability that a religious type acquires secular values.

For a secular agent \( i = s \), we have:

\[
u_s(v) = z_{ss} - \alpha(1 - pg(v))[z_{ss} - z_{sr}] - c(v) \\
\equiv z_{ss} - \alpha(1 - pg(v))\lambda_s - c(v), \tag{3}\]

\(^{18}\)We could assume that \( c \) is decreasing in \( v \) up to some point, so that agents have a taste for a positive degree of veiling. However, we choose to abstract from taste-based motives of veiling, to focus on our cultural resistance motivation.
where we have defined $z_{ss} - z_{sr} \equiv \lambda_s > 0$ as the cost of not engaging in religiously prohibited behavior for a secular type. We shall refer to $\lambda_s$ as the \textit{intensity of disapproval by secular types}. Here secular types experience an expected loss of $\alpha(1 - pg(v))\lambda_s$ from acquiring religious values and refraining from religiously prohibited behavior. Veiling serves to inflate this expected loss by increasing the probability that a secular type acquires religious values.

These observations lead to the following proposition.

\begin{proposition}
In the absence of social payoffs, there exists a unique optimal degree of veiling $v_i$ for each type, which is independent of the religious composition of the community, $q$.

(i) A religious type chooses a positive degree of veiling, $v_r$, which is increasing in:

(a) the degree to which the environment is secular, $p$,

(b) the intensity of disapproval by religious types, $\lambda_r$.

(ii) A secular type chooses not to veil $v_s = 0$.

The proof is trivial and follows by taking first-order conditions and imposing the assumptions we have made on $g$ and $c$.

Therefore, religious types adopt veiling as a form of cultural resistance, to prevent themselves from acquiring secular values and engaging in religiously prohibited behavior. As we have not yet introduced social payoffs, we call this the \textit{personal commitment} motivation for veiling. Accordingly, there is a greater incentive to veil in a more secular environment (i.e. high $p$) and when secular behavior evokes greater disapproval from a religious type (high $\lambda_r$). In addition, we find that secular types never veil without social payoffs.

\subsection{The Need for Social Influence}

While modeling veiling in a cultural transmission framework immediately yields some insights, we believe there are some important features of veiling that this model fails to capture. Firstly, agents have no concern for the opinions of members of their community, contrary to ethnographic and survey-based evidence that veiling decisions are significantly influenced by opinions of family, friends and other community members (e.g. Brenner
Consequently, an agent’s decision to veil is independent of the religious composition of her community \( q \). Hence, while agents veil to resist the influence of a secular environment, community pressure does not bear upon their decision to veil. An agent in a more religious community does not adopt a higher degree of veiling.

Secondly, secular types never veil in the basic model. Yet a key feature of the debate on veiling is social pressure on secular women to veil (see Kuran 1995, p. 8-9, 16). Veiling by women due to social pressure is part of an important class of identity-related behavior, which Kuran (1998, p. 649-50) refers to as ‘ethnic preference falsification’. Some form of social payoffs is required in our model to induce such dissimulation.

These considerations motivate the incorporation of social influence into our model of veiling. The context suggests a novel framework for social influence, that may be useful in future work. Moreover, the marriage of the cultural transmission and social influence components of our model suggests a different perspective on the new veiling movement, based on the dislocation between the values/behavior encountered in the environment in which one interacts (e.g. goes to school, work) and those prevailing in one’s community (the group whose opinions one cares about).

4 Veiling Norms

In this section, we introduce a novel framework for social influence and incorporate it into the cultural transmission model of veiling developed in the previous section.

4.1 Social Payoffs

The second component of our model is a framework for social influence, in which agents care about what other members of their community think of them, even though these opinions may proceed from different values to their own. In the same way that agent \( i \) judges her (date-2) behavior by her values at date 0, agent \( i \)'s choice of behavior \( x \) is judged by agent \( j \) based upon \( j \)'s values. Suppose agent \( j \) believes \( i \) will take action \( x \). Agent \( j \) takes this action and evaluates it using her utility function, yielding \( z_{jx} \). That is her opinion of agent \( i \)'s behavior. Now agent \( i \) cares about \( j \)'s opinions, along with

\[ \text{Bayat (2007) identifies an active interest in the conduct of others as a key feature of the contemporary Islamic movement in Egypt: “Unlike the passively pious who remained indifferent about other people’s religiosity, the actively pious began to judge others for what and how they believed” [p. 150].} \]
the opinions of other community members, so that j’s evaluation of her action enters i’s utility function via social payoffs. We believe that this yields an intuitive and disciplined model of social influence, which is based solely on the utility functions of the players. Inter alia \( z_{rr} > z_{rs} \), so that agents engaging in religiously prohibited behavior are subject to disapproval from religious types in their community.

We assume, as in our motivating story, that community members cannot observe another agent’s behavior. Nevertheless, they can form an inference regarding her behavior from her veiling decision (which is publicly observable) and beliefs about the agent’s type (which is private information). Let \( \beta \) be the (endogenous) probability that all other players assign to agent \( i \) having religious values at date 0 upon observing \( i \)’s choice of veiling \( v \). Agent \( j \)’s opinion of \( i \)’s inferred behavior is:

\[
S_j(v, \beta) = \alpha p_g(v) z_{js} + \alpha (1 - p_g(v)) z_{jr} + (1 - \alpha) [\beta z_{jr} + (1 - \beta) z_{js}]
\]

\[
= [\alpha p_g(v) + (1 - \alpha)(1 - \beta)] z_{js} + [\alpha (1 - p_g(v)) + (1 - \alpha) \beta] z_{jr}
\]

\[
\equiv f(v, \beta) z_{js} + (1 - f(v, \beta)) z_{jr},
\]

where \( f(v, \beta) \) denotes the probability that agent \( j \) assigns to \( i \) acquiring secular values and engaging in religiously prohibited behavior during the period, given \( i \)’s degree of veiling \( v \) and \( j \)’s belief regarding \( i \)’s initial type.

Now agent \( i \) is judged in this manner by each member of her community. Recall that the proportion of religious types in the community at the beginning of the period is \( q \). Therefore, opinions integrated over all community members amount to the social payoff:

\[
S(v, \beta) = q S_r(v, \beta) + (1 - q) S_s(v, \beta).
\]

This yields a type-dependent model of social influence. The greater the proportion of religious types in the community \( q \), the more heavily religious standards \( S_r(v, \beta) \) weigh in social opinions. We write the expected total payoff for agent \( i \) when choosing veiling \( v \), under the belief \( \beta \) regarding her initial type as:

\[
U_i(v, \beta) = u_i(v) + S(v, \beta).
\]

4.2 Social Commitment

Let us begin our analysis of veiling under social influence with the perfect-information benchmark case in which agent \( i \)’s type (i.e. initial values) is common knowledge. This
removes all information asymmetry from the model and enables us to isolate what we call the \textit{social commitment} motivation for veiling. The more highly religious the community (high $q$), the more agents are inclined to veil in order to publicly resist acquiring/retaining secular values and being the subject of disapproval in their community.

**Proposition 2** Given social payoffs and perfect information about types, there exists a unique optimal degree of veiling $\overline{v}_i$ for each type.

(i) A religious type chooses a positive degree of veiling $\overline{v}_r$ if and only if $q > q \equiv \frac{\lambda_r - \lambda_s}{\lambda_r + \lambda_s}$.

(ii) A secular type chooses a positive degree of veiling $\overline{v}_s$ if and only if $q > \overline{q} \equiv \frac{2\lambda_s}{\lambda_r + \lambda_s}$.

In addition, whenever $\overline{v}_r > 0$, $\overline{v}_r > \overline{v}_s$.

The proofs of this and all further propositions are contained in Appendix D. The intuition behind Proposition 2 is straightforward. Recall that religious agents benefit from the \textit{personal commitment} effect of veiling, whereas secular agents bear a cost from increasing the likelihood that they acquire religious values. This is why veiling is higher for religious types, even though social payoffs are the same for both types.\(^{20}\) In Bisin and Verdier’s (2000, 2001) work, which was the first to analyze cultural transmission with endogenous socialization effort, agents always want to retain their existing cultural trait. In our model, the addition of social influence means that there are conditions in which an agent would like to switch cultural traits. According to Proposition 2, when there is a large proportion of religious types in the community (i.e. $q > \overline{q}$), so that agents are judged by more religious standards, even secular types find it beneficial to veil. Conversely, when $q$ is sufficiently low (i.e. $q \leq \overline{q}$), so that secular behavior is highly valued in the community, even religious agents quit resisting the transmission of secular values through veiling.

Our results can be partly summarized by Figure 2, which depicts how optimal veiling $\overline{v}_i$ depends on $q$, when disapproval by religious types is (a) less intense than disapproval by secular types, and (b) more intense than disapproval by secular types.\(^{21}\) We see that veiling by religious types with social payoffs $\overline{v}_r$ is less than under personal payoffs alone, when the proportion of religious types in the community is less than some threshold $\overline{q}$ (to be defined in the next section), and \textit{vice versa}.

\(^{20}\)This is also why the threshold for positive veiling by religious types, $q \equiv \frac{\lambda_r - \lambda_s}{\lambda_r + \lambda_s}$, is lower than the threshold for preferring to be identified as a religious type $\overline{q} \equiv \frac{\lambda_s}{\lambda_r + \lambda_s}$, and \textit{vice versa} for secular types.

\(^{21}\)The formal comparative static results are provided in section 5.1.
4.3 Social Signaling

When introducing imperfect information about an agent’s type, there is an important source of information asymmetry. An agent knows her type (i.e. initial values), but her community does not. Because an agent who does not enter a cultural transmission phase retains her initial values, an agent who begins the period with religious values is more likely to end the period with religious values, for any given degree of veiling. In addition, only religious agents have a personal commitment motivation for veiling. Thus, a religious type can communicate that her behavior is more likely to conform to religious standards at the end of the period, by further increasing veiling to signal her existing religious values. We call this the social signaling motivation for veiling.\footnote{Veiling may be an especially important signal of religious values for Muslim women, because unlike men who participate in communal prayer in the mosque, they tend to pray in the privacy of the home (e.g. MacLeod 1991, p. 39). Based upon interviews with veiled women in London, Omkar (2007) proposes that high degrees of veiling signal deep religious values. For example, one of his respondents suggests that “I am a religious person... that shows in my actions, in the way I dress” [p. 67].}

The equilibrium concept we employ is Perfect Bayesian equilibrium [PBE].\footnote{See Fudenberg & Tirole (1991, p. 331-3) for a formal definition.} In a PBE, beliefs are consistent with the equilibrium, and actions are optimal given beliefs. Out-of-equilibrium beliefs, however, are arbitrary. Following Austen-Smith & Fryer (2005), we use the D1 refinement introduced by Cho & Kreps (1987) to restrict these beliefs. Now denote the probability assigned to an agent being a religious type by $\beta(v)$, so that the
belief is explicitly a function of veiling. Suppose that whenever secular types are weakly better off deviating to \( v \) from their equilibrium identity choice, religious types are \textit{strictly} better off deviating to \( v \). Then according to D1, the probability assigned to an agent choosing veiling degree \( v \) being a religious type is \( \beta(v) = 1 \). A formal statement of the D1 criterion adapted to our context is contained in Appendix C. This standard criterion guarantees that religious types adopt a (weakly) higher degree of veiling than secular types in equilibrium.

Our signaling model is distinctive in several ways. First, in existing social signaling models (e.g. Bagwell & Bernheim 1996, Levine 1998, Austen-Smith & Fryer 2005), there is a universally superior type with whom every player would like to be identified (e.g. wealthy type), regardless of the distribution of types. In our model, the values an agent would like to signal depend upon the composition of her ‘audience.’ We can determine whether an agent would like to be identified by their community as a religious or secular type by differentiating the social payoff in (5) with respect to \( \beta \):

\[
\frac{\partial U_i(v, \beta)}{\partial \beta} = (1 - \alpha) [q\lambda_r - (1 - q)\lambda_s].
\]  

(7)

For both types, this expression is positive if and only if \( q > \tilde{q} \equiv \frac{\lambda_s}{\lambda_r + \lambda_s} \in (0, 1) \). Therefore, when the proportion of religious types in the community is sufficiently large, both religious and secular agents would like to be identified as religious, and \textit{vice versa}. Thus, unlike standard signaling models, the veiling equilibria in our model depend upon the distribution of types in the population \( q \).

One additional feature of our approach is that we have not directly imposed the Spence-Mirrlees sorting condition for veiling – the marginal cost of veiling \( c(v) \) is the same for both types. Instead, the sorting condition emerges from the fact that religious agents bear a larger personal loss from acquiring secular values and engaging in religiously prohibited behavior.

Define \( \sigma_i \) as a mixed strategy in which agent \( i \) puts weight \( \sigma_i(v) \) on veiling \( v \). Let \( v^*_r \) be the solution to \( U_s(v^*_r, 1) = U_s(\bar{v}_s, 0) \), if one exists, and zero otherwise (i.e. \( v^*_r \) defines the minimal separating equilibrium).

We can now state the following proposition.

\footnote{A solution to this equation always exists when agents prefer to be identified as a religious type, i.e. \( q \geq \tilde{q} \).}
Figure 3: Social Signaling. Veiling $v$, under imperfect information about types, as a function of the proportion of religious types $q$ in the community, for secular types (dark) and religious types (light). The vertical dotted lines represent mixing by religious types between $\pi_r$ and zero. The oblique dotted line represents veiling by religious types under perfect information about types.

**Proposition 3** Given social payoffs and imperfect information about types, for each $q \in (0,1)$ there exists a unique PBE that satisfies the D1 criterion, as follows:

(i) Equilibrium veiling for a secular type is $\sigma_s^*(\pi_s) = 1$ for all $q \in (0,1)$.

(ii) Equilibrium veiling for a religious type is:

\[
\begin{align*}
\sigma_r^*(0) &= 1 & \text{for } q \leq q_1, \\
\sigma_r^*(0) &= b \text{ and } \sigma_r^*(\pi_r) &= 1 - b & \text{for } q_1 < q < q_2, \\
\sigma_r^*(\max\{\pi_r, v_r^*\}) &= 1 & \text{for } q \geq q_2,
\end{align*}
\]

where $b$ decreases continuously from 1 to zero as $q$ goes from $q_1$ to $q_2$.

Therefore, for each $q$ there is a unique D1 PBE, and the structure of equilibria depends in a non-trivial way on $q$. The beliefs that are part of the equilibria are stated in Appendix D. The equilibria can be conveniently represented by Figure 3.

In the low-veiling regime ($\lambda_r \leq \lambda_s$), signaling concerns induce a zero-veiling pooling equilibrium for $q \in [0, q_1]$. As $q_1 > q$, this is a larger interval than the zero-veiling region under perfect information, $[0, \bar{q}]$. For $q_1 < q < q_2$, the unique equilibrium that satisfies the D1 criterion is a hybrid equilibrium in which secular types choose $\pi_s = 0$ with probability one, and religious types choose $\pi_s = 0$ with probability $b$ and $\pi_r > 0$ with complementary probability. At this level of $q$, both types want to be identified as secular (for reputational reasons), but religious types want to veil (for personal commitment reasons). If a religious
type pools on zero veiling with secular types, she is believed to be secular with probability 
\((1 - q)\). At \(q_1\), this inference is no longer attractive enough to stop her from veiling. But 
then if a separating equilibrium is proposed, a religious agent is believed to be secular with 
probability one if she deviates to \(v = 0\). This inference is attractive enough to stop her 
veiling, as long as \(q < q_2\). Therefore, the unique D1 equilibrium is a hybrid equilibrium 
in which religious types mix between their perfect-information optimal degree of veiling 
and pooling with secular types on zero veiling.\(^{25}\)

If the proportion of religious types in the community is sufficiently large, then the unique 
D1 equilibrium is separating, and in particular the Riley equilibrium (Riley 1979), which 
is Pareto-dominant among separating equilibria. Figure 3 is drawn for the case in which 
there exists a threshold \(q_3\) such that for all \(q > q_3\), religious types have to increase their 
veiling above their full information optimum \(\bar{v}_r\) to avoid being mimicked by secular types.

The only differences in the high-veiling regime \((\lambda_r > \lambda_s)\), is that religious types always 
choose a positive degree of veiling, and secular types choose a positive degree of veiling 
when \(q\) is sufficiently high.

### 5 Cultural Resistance & the New Veiling Movement

The view of veiling as a form of cultural resistance yields several comparative statics 
results and testable predictions. In this section, we conduct the comparative statics 
analysis, and develop one possible account of the factors behind the new veiling movement.

#### 5.1 Comparative Statics & Testable Predictions

The comparative statics results are as follows.

**Proposition 4** Whenever positive, \(\bar{v}_r\) and \(\bar{v}_s\) are:

(i) strictly increasing in the degree to which the community is religious, \(q\),

(ii) strictly increasing in the degree to which the environment is secular, \(p\),

\(^{25}\) Mixing does not mean switching between degrees of veiling from day to day. In fact, we do not 
think of veiling decisions as being made very often in an agent’s lifetime. Our result simply implies that 
some religious types veil, while others do not, when there is an ‘intermediate’ degree of religiosity in the 
community’. If the model were generalized to a continuum of types, this mixing result would disappear, 
while preserving the flavor of the existing results.
(iii) strictly increasing in the intensity of disapproval by religious types, $\lambda_r$,

(iv) strictly decreasing in the intensity of disapproval by secular types, $\lambda_s$.

The only difference for $v^∗_r$ is that $v^∗_r$ is strictly increasing in $p$ if and only if $q > \overline{q}$.

The intuition behind parts (i), (iii) and (iv) is that agents are judged based upon stricter religious standards when there is a higher proportion of religious types in the community and disapproval by religious types is intense relative to disapproval by secular types. Hence both secular and religious types increase veiling under these conditions to resist acquiring secular values. According to part (ii) of the Proposition, when positive, the degree of veiling by agents under perfect information is increasing in the risk of acquiring secular values $p$. Religious and secular types veil only when acquiring/retaining secular values is costly to them. In this case, the greater the risk of acquiring secular values $p$, the greater the need for veiling to reduce the expected cost of acquiring secular values.

The only difference when it comes to the degree of veiling under imperfect information is that religious types may need to increase veiling beyond $\overline{v}_r$ to separate from secular types and signal religious values. In this case, $v^∗_r$ is strictly increasing in $p$ if and only if $q > \overline{q}$. Thus, we can still say that in highly religious communities, veiling is increasing in the degree to which the environment in which agents interact is secular.

The main testable implication of our theory is that veiling should be highest among women who come from highly religious communities and interact in highly secular environments.\footnote{Because both religious and secular types veil only when acquiring/retaining secular values is costly to them, the converse is not true; women from highly secular communities also adopt higher degrees of veiling in more secular environments.} For example, in a non-Muslim majority society, a random assignment of individuals from a single local community to different schools should lead to higher veiling among individuals allocated to schools with fewer Muslim pupils.\footnote{Of course, the analysis would need to be restricted to schools that do not regulate (i.e. either mandate or ban) veiling.} A possible test in Muslim societies could be whether veiling rose at the neighborhood level with the introduction of television.\footnote{In section 5.2 we shall argue that veiling may be partly a response to exposure to secular lifestyles and ideals represented in Western cultural products, such as television shows, movies and magazines.}

On the basis of our results, we would expect this effect to be pronounced in more religious neighborhoods. In contrast, an increasing-returns/tipping-point model of veiling (Schelling 1978a, Kuran 1995, 1998), in which agents veil to keep up with veiling by their peers, would predict lower veiling in more secular environments.
Our theory also leads to an account of the rise in veiling since the 1970s. In particular, we suggest that the new veiling movement could be due in part to the increased exposure of women from highly religious communities to secular lifestyles and ideals.

5.2 Secular Environments, Religious Communities

Veiling in our model is highest when women from highly religious communities interact in highly secular environments. On this basis, we suggest that the new veiling movement could be related to migration to large cities within Muslim societies such as Egypt and Turkey, as well as migration to Europe and the United States, where people are exposed to more liberal mores and opportunities for religiously prohibited behavior. An associated trend is the influx of Muslim women into formal education and employment since the 1970s, especially women from traditional rural backgrounds (e.g. MacLeod 1991). In the context of our model, these changes can be represented by an increase in $p$. Our conception of veiling as cultural resistance, suggests that some Muslim women may have responded to these changes by stepping up their degree of veiling in order to resist the secular values/behavior with which they come into contact, and which meet with disapproval in their communities. Therefore, the prominence of educated, middle-class women in the new veiling movement is not surprising, when veiling is viewed as a form of cultural resistance.

These and other hypotheses in this paper should be the subject of statistical testing, and hopefully our analysis can provide some guidance for future empirical work. For the moment, however, we can point to ethnographic evidence that is consistent with this account of the new veiling movement. According to El Guindi (1981):

[A] more balanced proportion of men and women on university campuses means that for nine months of the year young women are out in overcrowded streets, and on public transportation and campuses, with men. These are the same women who are socialized to stay apart from men, protect their virginity and honor, and remain controlled by their male relatives until marriage. So on the one hand there is a tradition to keep the sexes apart, and on the other a social reality which does not.

While, education and employment may provide substantial economic benefits and are often the only assurance of a middle-class lifestyle (e.g. MacLeod 1991), they can also

\footnote{For example, the enrollment of Egyptian women in secondary school increased from 7% in 1950 to 58% in 1987. Female enrollment rates at tertiary level increased from 1.6% to 14.8% (UNESCO Statistical Yearbook, 1970, 1971, 1990). This appears to be part of a broader integration of women into public life.}
undermine the customary segregation of the sexes by placing men and women side-by-side in educational institutions, workplaces and public spaces (e.g. streets and buses). A content analysis conducted by Mernissi (1987) of 402 letters to a religious counseling service on Moroccan state television reveals a preoccupation with issues of sexuality arising from mixing of the sexes. For example, women asked whether swimming unveiled on a mixed-sex beach or kissing a man outside of marriage is acceptable. Smith-Hefner (2007, p. 401) writes:

[A]t Gadjah Mada University [in Indonesia], the proportion of women veiling increases dramatically between the first year of schooling and later years. Many female students describe themselves as having been confused and insecure when they first came to the university and experienced its overwhelming freedom and diversity. Campus religious organizations, friends and family members, religious teachers, and Islamic publications all reinforce a message of the dangers of free interaction between the sexes and press the case for veiling as the solution.

Bayat (2007) suggests that, “Affluent Muslim women, in comparison with men, the poor, and non-Muslims, showed a greater inclination to piety because their class position and lifestyle were more closely associated with “sin” and therefore caused guilt” [p. 158]. Accordingly, Mule & Barthel (1992, p. 324) write of educated women who take up formal employment, “It was not simply a case of their having the world to gain, as they claimed individual rights and autonomy, and freed themselves from patriarchy. They also had a world to lose: the world of traditional societal esteem” [p. 324]. As in Mule and Barthel’s (1992) work, veiling in our model is a strategy for taking advantage of opportunities outside the community, while maintaining esteem within the community.

Furthermore, the rise in veiling since the 1970s may also be attributable to increased exposure to secular lifestyles and ideals in Western culture, which can also be represented in our model by a rise in $p$. This might explain high rates of veiling observed among Muslim immigrants in the West, even relative to their country of origin. While cultural changes in the West would have been felt directly by Muslim minorities in the United States and Europe, more liberal ideals in terms of sexual behavior and male-female interaction were culturally transmitted to Muslim societies via imported cultural products (e.g. movies, television, magazines, etc.). For example, Mule & Barthel (1992) propose that, “Expo-

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30 Rohde (2008) surveys a controversial debate over female sexuality and social norms played out in the Iraqi print media in the late 1960s and early 1970s. A German film depicting a woman ‘searching for sexual freedom’ was shown in Baghdad in 1971, with the explicit aim of changing attitudes toward sexuality. A series of articles calling for sexual liberalization, free mixing of the sexes and gender equality were printed in state newspapers. Rohde (2008) concludes that “during the late 1960s and early 1970s a general mood of departure from established social norms existed in Iraq that bore connotations of sexual freedom” [p. 145].
sure to secularized Western culture has presented a traditionally Islamic country [Egypt] with new gender ideologies and an image of the New Woman: a Western-style woman whose life is free of the chador and, supposedly, of social constraints” [p. 327]. Hoffman (1995) claims that “American television shows ... are perceived as truly representative of American life. They depict a society dominated by crass materialism, excessive individualism, and sexual immorality, and are seen as undermining the Muslim family by introducing aspirations toward materialism and sexual liberation” [p. 218]. Thus, the rise in veiling since the 1970s may be motivated in part by the desire to resist the transmission of secular values ‘embedded’ in Western cultural representations of secular lifestyles and religiously prohibited behavior.

One reason why women might care about the opinions of community members and be keen to resist secular values/behavior is to improve their marriage market prospects. Blaydes & Linzer (2008) claim, “A common feature across the contemporary Muslim world is the premium placed on conformity to conservative norms and perceived piousness for women seeking marriage” [p. 584]. According to Rugh (1984), “A girl wearing Islamic dress announces herself to be one of the moral types men like to marry and maybe attracts a man’s attention on campus as a result” [p. 232]. Our model explains both why veiling is a credible signal of religious values and how (time-invariant) marriage market concerns may be part of an explanation for the rise in veiling since the 1970s. In particular, our theory suggests that increased exposure to secular values may have made women who actively resist such values even more attractive on the marriage market, especially in highly religious communities. Hence, our model can be viewed as representing marriage market concerns in reduced form, while also taking into account that individuals may have other reasons to care about the opinions of community members (e.g. social esteem, social insurance).

6 Dynamics & Policy

To determine the long-run effects of bans on veiling, we need to analyze the coevolution of identity and values. The stage game analyzed so far can be embedded in a recurrent game in which each agent in time period $t$ (which is composed of three dates as above) gives birth to one agent at the beginning of $t + 1$, who inherits her parent’s type. Choice is myopic: agents simply maximize current period payoffs in the stage game.\(^{31}\) In this

\(^{31}\)If our model is interpreted as a parent choosing a degree of veiling for their child, then this myopic choice assumption translates to a parent only caring directly about their child’s welfare, and not about
section, we derive the stationary distribution of types in the recurrent game and study the effects of veiling prohibitions on the religious composition of communities in the long run.

### 6.1 Steady-State Religiosity

Denote the proportion of religious types in the population at the beginning of period $t$ by $q^t$. A steady state, denoted by $\hat{q}$, has the following property: if $q^t = \hat{q}$, then $q^{t+k} = \hat{q}$ for all $k > 0$. The following proposition characterizes the steady states of the recurrent game:

**Proposition 5** A steady state solves:

$$
q = \hat{q} \equiv \frac{1 - pg(\overline{v}_s)}{p[\sigma^*_r(0)g(0) + (1 - \sigma^*_s(0))g(\max\{\overline{v}_r, v^*_r\})] + (1 - pg(\overline{v}_s))}.
$$

(i) There exists at least one steady state,

(ii) Denote the set of steady states by $\hat{Q}$. Every steady state $q \in \hat{Q}$ is interior,

(iii) From any initial state, $q^t$ converges to a steady state.

Therefore, at least one stable steady state exists, but we cannot rule out multiple steady states. Notice that the right-hand side of (8) is independent of $q$ when veiling for both types is set to zero, so that there is a unique steady state $\hat{q}$ in this case. Hence it is veiling that generates multiple equilibria: not only does veiling increase steady-state religiosity then, by inhibiting the transmission of secular values, but the practice of veiling could also lead to large shifts in religiosity in response to small exogenous shocks to $q$, as the community tips into a different steady state. Finally, we have shown that in all steady states (including unstable ones) religious and secular types coexist, and that the community ends up in a steady state from any initial state.\(^{32}\)

This dynamic analysis can be used to assess the implications of veiling bans on the religious composition of communities.

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\(^{32}\)This makes veiling in our model different to fashion, in the sense that the dynamics are not cyclic (see Karni & Schmeidler 1990, Pesendorfer 1995).
6.2 Bans on Veiling

When veiling is viewed as a form of cultural resistance, it is not surprising that bans on veiling are supported by those favoring secularization and cultural assimilation by immigrants. By inhibiting the transmission of secular values, veiling increases the steady-state proportion of religious types in the community. However, we shall proceed to show that this is not necessarily the case when agents can choose whether to segregate by interacting only in their community or integrate by taking up study/work outside the community, in a more secular environment. In the formulation of the model analyzed so far, we have implicitly assumed that all agents integrate.

Denote the integration decision by $\ell \in \{0, 1\}$, where $\ell = 0$ is segregation and $\ell = 1$ is integration. Suppose that the (additive) return to integration is $y$, which might reflect higher wages, superior leisure opportunities, etc. As before, assume that an agent who integrates enters a cultural transmission phase with probability $\alpha$ and acquires secular values with probability $pg(v)$. The only difference for an agent who segregates is that, in a cultural transmission phase, she acquires secular values with probability $\delta > 0$. The inverse, $\delta^{-1}$, represents the effectiveness of segregation in resisting secular values. The idea here is that an agent who segregates in her local community could face less exposure to secular values and opportunities for engaging in religiously prohibited behavior, regardless of her degree of veiling. Thus segregation serves as a (costly) substitute for veiling. \(^{33}\)

Now suppose that a ban on veiling in public spaces (e.g. schools, universities) is introduced. When integrating a woman must choose veiling $v = 0$. This means that beliefs regarding an agent’s type are not conditioned upon her veiling decision, since veiling is exogenous regardless of whether agents integrate or segregate. Only the integration decision $\ell$ matters for beliefs. Let us write beliefs under restricted veiling by $\tilde{\beta}(\ell)$. Hence the payoff to an agent who integrates is $y + U_i(0, \tilde{\beta}(1))$. We denote the payoff to an agent who segregates by $\tilde{U}_i(\tilde{\beta}(0))$.

The following proposition characterizes the effect of a ban on veiling on the religious composition of communities:

\(^{33}\)In fact, veiling plays no role in cultural transmission when an agent segregates. This highlights the role of veiling in our model as a strategy for integration. If segregation means confinement to the home, then a woman who segregates may not veil at all. Nevertheless, we could allow agents who segregate to choose any degree of veiling, for reasons outside of the model.
Proposition 6 Let $q^1$ be a steady state equilibrium under unrestricted veiling in which both types integrate and at least one type chooses a positive degree of veiling with probability one. Introduce a ban on veiling during period 1.

If the return to integration $y$ is sufficiently low and the effectiveness of segregation in resisting secular values $\delta^{-1}$ is sufficiently high, then $q^t > q^1$ for all $t > 1$. That is, religiosity in the community is higher in every period after the ban is introduced.

The proposition begins by supposing that both types integrate and at least one type chooses a positive degree of veiling. This is the relevant case for policy analysis. Proceeding from such a state, we have shown that if the returns to integration are not high (e.g. low wages, low returns to education, high discrimination), then a ban on veiling can lead to a higher level of religiosity in the community. This works as follows. If the return to integration is low (low $y$), then a ban on veiling induces agents to segregate in their local community as a costly substitute for veiling. Hence, if segregation further reduces exposure to secular values (low $\delta$), then a ban on veiling inhibits the transmission of secular values.

We remark that this result holds even when some agents continue to integrate after the ban is introduced. A ban reduces veiling by those who continue to integrate and thus increases their likelihood of acquiring secular values. On the other hand, veiling can induce women (especially those with religious values) to segregate if the returns to integration are low, relative to the personal and reputational costs of interacting in a secular environment without veiling. When segregation is highly effective at reducing exposure to secular values (low $\delta$), the second effect dominates.

In our theory, veiling is a strategy to integrate into mainstream society while maintaining esteem within the community. Removing the option to veil can lead agents to adopt more costly substitutes for veiling such as segregation. Ultimately, the right veiling policy is a broader matter of justice which is well beyond the scope of this paper. However, our theory does suggest that on the same grounds that bans on veiling are sometimes advocated, they may turn out to be counterproductive by inhibiting the spread of secular values in highly religious communities.

There is empirical evidence to suggest that this is a genuine consideration. In recent

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 注34: If no type veiled, then a ban on veiling would be moot. If only secular types integrated, then a ban on veiling would not affect religious types who adopt higher degrees of veiling and transmit religious values.
work, Meyersson (2010) uses a regression discontinuity design, to compare the economic outcomes of elections where an Islamic party won or lost municipal mayor seats by a narrow margin. He finds that rule by an Islamic party leads to higher female (secular) education, particularly in poorer and more religious areas. Islamic rule also leads to greater female labor force participation and shifts in female employment from agriculture to services. Meyersson provides evidence that ruling Islamic parties increased provision of religious “add ons” such as Qur’anic study centers, prayer rooms and dormitories where the headscarf could be worn, creating a more religious educational environment that induced conservative Muslims to send their daughters to state schools, where the headscarf is banned.

7 Conclusion

The new veiling movement is a fascinating phenomenon which is missing from the list of canonical case studies in the economics of identity (see Akerlof & Kranton 2010). Because of its puzzling features and inherently, it is a genuine challenge for applied theory. We believe that viewing veiling as a form of cultural resistance provides a useful framework for understanding contemporary patterns of veiling in both predominantly Muslim and non-Muslim societies. Nevertheless, veiling is a highly complex phenomenon; we do not pretend to understand it completely, nor do we suggest that other motivations play no role in veiling. We have developed a formal model that suggests one possible explanation for veiling among educated, working, middle-class women and also contributes a new insight to the debate on the effects of bans on veiling. We hope the analysis provides some guidance for future theoretical and empirical work on the economic consequences of veiling, in terms of its role in the educational and labour market transitions of Muslim women. Finally, we believe this paper yields some broader insights, including a new notion of the role of social identity, an alternative model of social influence and a mechanism by which attempts to regulate identity can have perverse effects.

References


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Appendix A. Interaction Structure

Several different interaction structures are accommodated by the basic formulation of our model.

**Population game.** Let $p$ be the proportion of secular types in society (outside of community 1).\(^{35}\)

(i) **Immunization.** In a cultural transmission phase, agent $i$ is exposed to a ‘model’ drawn uniformly at random from society. If the model is a secular type, which occurs with probability $p$, agent $i$ acquires the model’s values with probability $g(v)$, which is decreasing in $i$’s degree of veiling.\(^{36}\)

(ii) **Segregation.** Each agent is exposed to a model and acquires the model’s values with probability one. The probability that an agent is exposed to a secular type is $pg(v)$. Hence, women adopting a higher degree of veiling are less likely to be matched with secular types in a cultural transmission phase.

**Temptation.** The parameter $p$ could also be viewed as a measure of temptation, which is a property of the environment.

(i) **Immunization.** An opportunity for engaging in religiously prohibited behavior arrives with probability $p$ and agents take up the opportunity with probability $g(v)$, which is decreasing in veiling.

(ii) **Segregation.** An opportunity arrives with probability $pg(v)$, so that the ‘base’ arrival probability $p$ is reduced in line with an agent’s degree of veiling. For example, veiled women may receive fewer offers to visit bars and fewer approaches by men.

Appendix B. Mechanisms

In this appendix, we motivate the main assumption in the paper, that veiling reduces the probability that an agent acquires secular values, i.e. $g'(v) < 0$. The different interaction structures accommodated by our model (see Appendix A) suggest mechanisms that are each sufficient to generate this effect.

\(^{35}\)More generally, $p$ could be the probability of contact with secular values, which is an increasing function of the proportion of agents in society with secular values. For example, the actual proportion could be amplified by media bias.

\(^{36}\)This interpretation gels with the literature on cultural evolution (see Cavalli-Sforza & Feldman 1981, Boyd & Richerson 1985, Bisin & Verdier 2001) and evolutionary game theory (e.g. Schlag 1998).
Immunization. In the immunization versions of our model, women who veil strive harder to conform to religious standards of behavior. A central idea in Akerlof and Kranton’s (2000, 2002, 2005) theory of identity, is that people try to live up to the ideal associated with their social category. More generally, the notion that people attempt to avoid cognitive dissonance arising from inconsistent attitudes/behaviors is well established in the psychology literature (e.g. Festinger 1957, Aronson 1969). Thus, our main assumption can be motivated on the basis that adopting an Islamic identity (e.g. veiling) and engaging in various forms of religiously prohibited behavior are inconsistent.37

This accords with a number of ethnographic accounts of veiling. Smith-Hefner (2007) provides a list of religiously prohibited behaviors that veiled women are expected to avoid:

[T]he ethical standards and behavioral restrictions associated with veiling are weighty, and most Muslims regard the decision to adopt the veil as something of a great behavioral divide. It is widely held, for example, that veiled women should not be loud or boisterous; hold hands with a member of the opposite sex (even if he is her fiancé); go out in public after evening prayers; patronize cafes or clubs; wear makeup or fingernail polish; smoke, dance, swim, or wear tight clothing; or ride on the back of a motorcycle holding on to an unrelated male driver. [p. 399]

Based on work in Indonesia, Brenner (1996) writes:

Consequently, women who wear Islamic clothing tend to be very careful of their behavior, along with their dress. Some feel that they must refrain from going to movies, gossiping, or engaging in any other frivolous activities; veiled women are especially cautious about their interactions with men lest they be accused of flirtatiousness or, worse, sexual impropriety... One student said, “When I started wearing jilbab [headscarf in Indonesia] my behavior changed. I kept wondering, ‘Is this a sin or not? Is this wrong or not?’ ” [p. 688]

Segregation. Veiling might segregate agents from secular individuals/activities, even while they integrate into mainstream society by studying and working outside the home. For example, discrimination against veiled women could mean that they interact with fewer secular types. Once again, inconsistency between veiling and norms of dress in locations such as bars and nightclubs could mean that contact with secular values and opportunities for religiously prohibited behavior present themselves less frequently to veiled women. One respondent in Read and Bartkowski’s (2000) study of veiled women in Austin, Texas,

37Veiling might also help remedy the imperfect recall of deeply held religious values (e.g. Benabou & Tirole 2010). This notion finds support in interviews with veiled women. For example, Smith-Hefner (2007) reports that for many women in Indonesia veiling is “a constant physical reminder, one that helps keep them from overstepping the bounds of moral propriety” [p. 401-402]. Droogsma (2007) suggests that veiling “functions as a reminder to the women to guard their behavior so that their lives please God” [p. 304].

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claims that, “The veil keeps us [Muslim women] from getting mixed up in American culture” [p. 407]. Droogsma (2007) reports the following response in her interviews, “For me to think of myself going into a bar as a [woman who wears hijab], it just doesn’t seem right, so it kind of helps you stay away from places you’re not supposed to be” [p. 304]. Another respondent who wears a headscarf reveals, “Nobody’s ever offered me drugs... nobody offered me a drink once I became Muslim... So [veiling is] a protection. I don’t have to have the strength to say ‘No,’ it’s just for the most part, the opportunities are not presented to me” [p. 304].

These immunization and segregation effects of veiling are captured by the simple assumption that a higher degree of veiling reduces the probability that an agent acquires secular values and thereby engages in religiously prohibited behavior.

Appendix C. D1 Criterion

In this Appendix, we restate the D1 criterion for our context. Cho & Kreps (1987) developed the D1 criterion for the case in which the player moving second chooses an action based upon their belief about the first mover’s type. In our model, the second movers (agents in the community $I$) simply form a belief about the first-mover’s type. The first-mover’s payoff depends directly upon this belief, because agents care about the opinions of members of their community. The restatement is as follows:

**D1 Criterion.** Consider a PBE in which type $i$ chooses veiling $\bar{v}$ and the equilibrium belief is $\beta(\bar{v})$. Define the set of out-of-equilibrium beliefs at which $i$ has a profitable deviation to $v$ as:

$$B_i(v) = \{\beta(v) \in [0,1] : U_i(v, \beta(v)) > U_i(\bar{v}, \beta(\bar{v}))\}.$$  

(9)

Similarly, define:

$$\bar{B}_i(v) = \{\beta(v) \in [0,1] : U_i(v, \beta(v)) = U_i(\bar{v}, \beta(\bar{v}))\}.$$  

(10)

According to the D1 criterion, if $B_s(v) \cup \bar{B}_s(v) \subseteq B_r(v)$, then $(s,v)$ can be pruned from the game, so that $\beta(v) = 1$ as long as $B_r(v) \neq \emptyset$. If $B_r(v) \cup \bar{B}_r(v) \subseteq B_s(v)$, then $(r,v)$ can be pruned from the game, so that $\beta(v) = 0$ as long as $B_s(v) \neq \emptyset$. 

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Appendix D. Proofs

In this Appendix, we set out the proofs of Propositions 2-6.

**Proof of Proposition 2.** First note that an agent’s type is common knowledge, so there is no strategic interaction. (i) The expected payoff to a religious type is:

\[
U_r(v) = \left( \alpha pg(v) \right) \left[ z_{rs} + q z_{rs} + (1-q) z_{ss} \right] + \left( \alpha \left( 1 - pg(v) \right) + (1-\alpha) \right) \left[ z_{rr} + q z_{rr} + (1-q) z_{sr} \right] - c(v).
\]

For an interior solution, the first-order condition with respect to \( v \) is:

\[-\alpha pg'(v) \left[ (1 + q) \lambda_r - (1 - q) \lambda_s \right] = c'(v), \]

where \( \lambda_r \equiv z_{rr} - z_{rs} \) and \( \lambda_s \equiv z_{ss} - z_{sr} \). As the LHS of (12) is positive for \( v > 0 \), the right-hand side must also be positive at an interior solution (otherwise the marginal utility of veiling would be negative for all \( v \)). This implies that:

\[(1 + q) \lambda_r > (1 - q) \lambda_s,\]

which is satisfied if and only if \( q > q \equiv \frac{\lambda_r - \lambda_s}{\lambda_r + \lambda_s} \). Notice that this inequality holds for all \( q > 0 \) if \( \lambda_r > \lambda_s \).

Suppose \( q > q \). To establish that a unique solution exists to the first-order condition (12) in this case, recognize that the LHS is positive (as \( g'(v) < 0 \)), bounded from above (as \( g' \) is bounded from below) and decreasing in \( v \) (as \( g \) is convex). The RHS is strictly increasing (as \( c \) is convex) and by assumption goes through the positive real line as \( v \) goes through the unit interval. Therefore, there is a unique value of \( v \) that satisfies the first-order condition and the second-order condition for a maximum. We denote this value by \( v_r \).

Conversely, when \( q \leq q \), the RHS of (12) is negative for all \( v \) which implies that the marginal utility of veiling is negative for all \( v \in [0, 1] \). Hence the optimal degree of veiling is \( v_r = 0 \) in this case.

(ii) The expected total payoff to a secular type is:

\[
U_s(v) = \left( \alpha pg(v) + (1-\alpha) \right) \left[ z_{sr} + q z_{rr} + (1-q) z_{sr} \right] + \left( \alpha \left( 1 - pg(v) \right) \right) \left[ z_{rr} + q z_{sr} + (1-q) z_{sr} \right] - c(v).
\]

For an interior solution, the first-order condition with respect to \( v \) is:

\[-\alpha pg'(v) \left[ q \lambda_r - (2 - q) \lambda_s \right] = c'(v), \]

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Again, as the LHS of (15) is positive for $v > 0$, the right-hand side must also be positive at an interior solution. Therefore:

$$q\lambda_r > (2-q)\lambda_s,$$

which is satisfied if and only if $q > \bar{q} \equiv \frac{2\lambda_s}{\lambda_r + \lambda_s}$. Notice that this inequality cannot hold when $\lambda_s > \lambda_r$, as $q \leq 1$.

In the same way that we established part (i), it is straightforward to show that if $q > \bar{q}$ then a unique interior solution exists to the first-order condition (15), which we denote by $\tau_s$. Conversely, if $q \leq \bar{q}$ then the optimal degree of veiling is $\tau_s = 0$.

Finally, we claim that if $\tau_r > 0$, then $\tau_r > \tau_s$. This holds if the marginal return to veiling is strictly higher for religious types for all $v$. We can establish this by subtracting the LHS of (15) from the LHS of (12) to get $-\alpha pg'(v)[\lambda_r + \lambda_s]$, which is indeed positive for all $v$. □

Proof of Proposition 3. The Proposition follows immediately from Lemmas 1-4 below.

**Lemma 1** For each $q \in (0, 1)$, there exists a unique equilibrium that satisfies the D1 criterion.

*Proof.* Cho & Sobel (1990) demonstrate that a unique D1 equilibrium exists under the following conditions:

1. If $\beta'' > \beta'$, then all types prefer $\beta''$ to $\beta'$,
2. A player’s utility function is differentiable and satisfies the Spence-Mirrlees sorting condition: $(\partial U_r/\partial v)(\partial U_r/\partial \beta) > (\partial U_s/\partial v)(\partial U_s/\partial \beta)$.

*Case 1:* $q > \tilde{q}$. Recall that:

$$\frac{\partial U_i(v, \beta)}{\partial \beta} = (1 - \alpha) [q\lambda_r - (1-q)\lambda_s].$$

For both types, this expression is positive if and only if $q > \tilde{q} \equiv \frac{\lambda_s}{\lambda_r + \lambda_s} \in (0, 1)$. Therefore condition (i) is satisfied in our setting.

38The conditions, as stated by Fudenberg & Tirole (1991, p.458), have been translated into our framework. An additional condition requiring the responder to react more favorably to the sender when she believes the sender is a ‘higher type’ is trivially satisfied in our setting, because the community responds by simply producing a belief $\beta$ regarding the sender’s type.
In addition, given that \(\partial U_r/\partial \beta = \partial U_s/\partial \beta > 0\) for \(q > \tilde{q}\), condition (ii) holds if and only if \(\partial U_r/\partial v > \partial U_s/\partial v\), which we have verified in the proof of Proposition 2. Therefore, there exists a unique D1 equilibrium in this case.

Case 2: \(q < \tilde{q}\). We can relabel types and responses, or equivalently switch the inequalities in conditions (i)-(ii). By (17), if \(\beta'' < \beta'\), then all types prefer \(\beta''\) to \(\beta'\), for \(q < \tilde{q}\). Hence (the relabeled) condition (i) is satisfied.

In addition, \(\partial U_r/\partial \beta = \partial U_s/\partial \beta < 0\) for \(q < \tilde{q}\). Therefore, \((\partial U_r/\partial v)(\partial U_r/\partial \beta) < (\partial U_s/\partial v)(\partial U_s/\partial \beta)\) [i.e. condition (ii) relabeled] holds if and only if \(\partial U_r/\partial v > \partial U_s/\partial v\), which we have established holds. Therefore, there exists a unique D1 equilibrium in this case.

Case 3: \(q = \tilde{q}\). In this case, (17) equals zero, so that payoffs are invariant to \(\beta\). This is fully equivalent to the perfect information case, as we can set \(\beta(v) = 0\) for all \(v\) for secular types and \(\beta(v) = 1\) for all \(v\) for religious types, without affecting payoffs. Therefore, agents choose their unique perfect-information degree of veiling \(\tau_i\), which are distinct for each type by Proposition 2.

This establishes the Lemma. □

**Lemma 2** There exists a threshold \(q_1 \in (q, \tilde{q})\) such that a pooling D1 equilibrium exists in which \(\sigma^*_s(0) = \sigma^*_r(0) = 1\) if \(q \leq q_1\). The beliefs that support the equilibrium are \(\beta(0) = q\) and \(\beta(v) = 1\) for all \(v > 0\).

**Proof.** Nothing is learned about types in a pooling equilibrium, so that \(\beta(0) = q\) is the only belief consistent with the equilibrium. D1 implies that \(\beta(v) = 1\) for all \(v > 0\) (see Fudenberg & Tirole 1991, p. 459).

Because religious types gain more from an upward deviation, we only need to check that the incentive-compatibility condition for religious types holds. A religious agent reveals her type by choosing \(v > 0\). Hence, the most profitable deviation for a religious type is her perfect-information optimum, \(\tau_r\). Under the specified beliefs, the incentive-compatibility condition is:

\[
U_r(0, q) \geq U_r(\tau_r, 1).
\]

This can be reexpressed as:

\[
U_r(0, 1) + S(0, q) - S(0, 1) \geq U_r(\tau_r, 1),
\]

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Expanding the LHS of this expression:

\[(1 - \alpha)(1 - q)[(1 - q) \lambda_s - q \lambda_r] \geq U_r(\bar{v}_r, 1) - U_r(0, 1). \tag{21} \]

At \(q = \bar{q} \equiv \frac{\lambda_s - \lambda_r}{\lambda_s + \lambda_r}\), the LHS of (21) is positive and the RHS is zero because \(\bar{v}_r = 0\) by Proposition 2(i). At \(q = \tilde{q} \equiv \frac{\lambda_s}{\lambda_s + \lambda_r}\), the LHS is zero and the RHS is positive because \(v_r > 0\) by Proposition 2(i) and \(v_r = \arg\max_{v \in [0, 1]} U_r(v, 1)\). Therefore, all that remains to show that there exists a number \(q_1 \in (q, \tilde{q})\) such that the putative pooling equilibrium is incentive-compatible for religious types for all \(q \leq q_1\), is that the LHS of (21) is strictly decreasing in \(q\) and the RHS is increasing in \(q\).

By differentiation this holds for the LHS for \(q \leq \tilde{q}\). For the RHS, we can calculate:

\[
\frac{d}{dq}[U_r(\bar{v}_r, 1) - U_r(0, 1)] = \frac{dU_r(\bar{v}_r, 1)}{dq} - \frac{dU_r(0, 1)}{dq} \\
= \frac{\partial U_r(\bar{v}_r, 1)}{\partial q} - \frac{\partial U_r(0, 1)}{\partial q} \\
= \frac{\partial}{\partial q}[U_r(\bar{v}_r, 1) - U_r(0, 1)] \\
= \frac{\partial}{\partial q}\left(\alpha [g(0) - g(\bar{v}_r)] \left\{ (1 + q) \lambda_r - (1 - q) \lambda_s \right\} - [c(\bar{v}_r) - c(0)]\right) > 0. \tag{22} 
\]

The second line of (22) follows immediately when \(\bar{v}_r = 0\) and by the envelope theorem otherwise.

This establishes the Lemma. □

**Lemma 3** There exists a threshold \(q_2 \in (q_1, \tilde{q})\) such that for each \(q \in (q_1, q_2)\) a hybrid D1 equilibrium exists in which \(\sigma^*_r(0) = 1\) and \(\sigma^*_r(\bar{v}_r) = 1 - b\) and \(\sigma^*_r(\bar{v}_r) = 1 - b\). Beliefs are \(\beta(0) = \frac{qb}{1-q(1-b)}\) and \(\beta(v) = 1\) for all \(v > 0\).

In addition, \(b\) is continuous and strictly decreasing in \(q\) for all \(q \in [q_1, q_2]\).

**Proof.** The belief \(\beta(0) = \frac{qb}{1-q(1-b)}\) follows from the equilibrium and the application of Bayes rule. Once again, D1 implies \(\beta(v) = 1\) for all \(v > 0\).

Firstly, we claim that there exists a unique value \(q_2 \in (q_1, \tilde{q})\) such that \(U_r(\bar{v}_r, 1) = U_r(0, 0)\) when \(q = q_2\), and \(U_r(\bar{v}_r, 1) < U_r(0, 0)\) if and only if \(q < q_2\). Let us establish this claim.
By definition, at \( q = q_1, U_r(\bar{\tau}_r, 1) = U_r(0, q) \). As \( U_r(0, \beta) \) is decreasing in \( \beta \) for all \( q < \tilde{q} \) and \( q_1 < \tilde{q} \), \( U_r(0, 0) > U_r(0, q) = U_r(\bar{\tau}_r, 1) \) at \( q = q_1 \).

At \( q = \tilde{q} \), agents are indifferent between being identified as a secular or religious type, so that \( U_r(0, 0) = U_r(0, 1) \) which is less than \( U_r(\bar{\tau}_r, 1) = \max_{\nu \in [0,1]} U_r(v, 1) \) [as \( \bar{\tau}_r > 0 \), because \( \tilde{q} > q \)].

In sum, \( U_r(0, 0) > U_r(\bar{\tau}_r, 1) \) at \( q = q_1 \) and \( U_r(0, 0) < U_r(\bar{\tau}_r, 1) \) at \( q = \tilde{q} \). To establish the claim then, it is sufficient that \( U_r(\bar{\tau}_r, 1) - U_r(0, 0) \) is strictly increasing in \( q \). Differentiating:

\[
\frac{d}{dq} [U_r(\bar{\tau}_r, 1) - U_r(0, 0)] = \frac{dU_r(\bar{\tau}_r, 1)}{dq} - \frac{dU_r(0, 0)}{dq} \\
= \frac{\partial U_r(\bar{\tau}_r, 1)}{\partial q} - \frac{\partial U_r(0, 0)}{\partial q} \\
= \frac{\partial S(\bar{\tau}_r, 1)}{\partial q} - \frac{\partial S(0, 0)}{\partial q} \\
= \frac{\partial}{\partial q} \left[ S(\bar{\tau}_r, 1) - S(0, 0) \right] \\
= \frac{\partial}{\partial q} \left[ \alpha p(g(0) - g(\bar{\tau}_r)) + (1 - \alpha) \right] \{ q \lambda_r - (1 - q) \lambda_s \} > 0.
\]

(23)

Where we have used the envelope theorem in the second line. This establishes the claim.

We shall now demonstrate the existence of the proposed hybrid equilibrium.

A secular type can do no better than by playing her part in the equilibrium, as \( \bar{\tau}_s = 0 \) and \( U_s(v, 1) < U_s(v, 0) < U_s(\bar{\tau}_s, 0) \) for all \( v > 0 \) when \( q < \tilde{q} \). If a religious type chooses \( v > 0 \), she reveals her type and hence will never choose a positive degree of veiling other than \( \bar{\tau}_r = argmax_{v \in [0,1]} U_r(v, 1) \). Define \( \beta^* \equiv \frac{\alpha \theta}{1 - q(1 - b)} \). For a religious type to mix in the proposed way, there needs to be a value \( b \in (0, 1) \) such that:

\[
\begin{align*}
U_r(\bar{\tau}_r, 1) &= U_r(0, \beta^*) \\
\iff U_r(\bar{\tau}_r, 1) &= U_r(0, 1) + S(0, \beta^*) - S(0, 1) \\
\iff U_r(\bar{\tau}_r, 1) - U_r(0, 1) &= S(0, \beta^*) - S(0, 1) \\
\iff \alpha p [g(0) - g(\bar{\tau}_r)] \left[ (1 - q) \lambda_s - (1 + q) \lambda_r \right] - \left[ c(\bar{\tau}_r) - c(0) \right] &= \frac{(1 - q)}{1 - q(1 - b)} (1 - \alpha) \left[ (1 - q) \lambda_s - q \lambda_r \right].
\end{align*}
\]

(24)

When \( b = 0 \) we have already established that the LHS of the last line of (24) is less than the RHS [i.e. \( U_r(\bar{\tau}_r, 1) < U_r(0, 0) \)]. When \( b = 1 \), the RHS is zero which is less than the LHS which is positive, since \( U_r(\bar{\tau}_r, 1) > U_r(0, 1) \) by the definition of \( \bar{\tau}_r \), for \( q > \tilde{q} \).
In addition, the LHS is independent of \( b \) by inspection. The RHS is strictly decreasing in \( b \). Taken together, this implies that there exists a unique \( b \in (0, 1) \) such that a religious type is indifferent between choosing \( v = 0 \) and \( v = \bar{v}_r \), and is therefore willing to mix between the two actions with weight \( b \) on \( v = 0 \).

We shall now show that \( b \) is strictly decreasing in \( q \). Firstly, write the LHS of (24) as \( F(\bar{v}_r, q) \) and the RHS as \( G(b, q) \). Implicitly differentiating equation (24) with respect to \( q \) yields:

\[
\frac{\partial F}{\partial q} + \frac{\partial F}{\partial \bar{v}_r} \frac{d\bar{v}_r}{dq} = \frac{\partial G}{\partial q} + \frac{\partial G}{\partial b} \frac{db}{dq} \tag{25}
\]

Let us sign each term in (25). Firstly, recall that \( F(\bar{v}_r, q) = U_r(\bar{v}_r, 1) - U_r(0, 1) \). By the same reasoning as in (23), \( \frac{\partial F}{\partial q} = \frac{\partial}{\partial q} \left( [\alpha p(g(0) - g(\bar{v}_r))] (1 - q)\lambda_s - q\lambda_r \right) > 0 \), because \((1 - q)\lambda_s > q\lambda_r \) for \( q < \tilde{q} \). Therefore, the first term on the LHS of (25) is positive.

Secondly, \( \frac{\partial F}{\partial \bar{v}_r} = \frac{\partial U_r(\bar{v}, 1)}{\partial v} \bigg|_{v=\bar{v}_r} = 0 \). Hence the second term on the LHS of (25) is zero.

Thirdly:

\[
\frac{\partial G}{\partial q} = -\frac{b}{(1 - q(1 - b))^2} (1 - \alpha)((1 - q)\lambda_s - q\lambda_r) - \frac{(1 - q)}{1 - q(1 - b)} (1 - \alpha)(\lambda_s + \lambda_r) < 0. \tag{26}
\]

Fourthly:

\[
\frac{\partial G}{\partial b} = -\frac{q(1 - q)}{(1 - q(1 - b))^2} (1 - \alpha)((1 - q)\lambda_s - q\lambda_r) < 0. \tag{27}
\]

Taken together, these results imply that \( db/dq < 0 \) for \( q \in (q_1, q_2) \).

Finally, \( U_r(\bar{v}_r, 1) = U_r(0, q) \) when \( q = q_1 \), so that \( b = 1 \). When \( q = q_2 \), \( U_r(\bar{v}_r, 1) = U_r(0, 0) \) so that \( b = 0 \). Therefore, \( b \) decreases continuously from 1 to zero as \( q \) goes from \( q_1 \) to \( q_2 \). □

**Lemma 4** Suppose \( q \geq q_2 \). Let \( v^*_r \) be the solution to \( U_s(\bar{v}_s, 0) = U_s(v^*_r, 1) \), if one exists, and zero otherwise. The unique D1 equilibrium is the Pareto-dominant separating equilibrium in which \( \sigma^*_s(\bar{v}_s) = 1 \) and \( \sigma^*_r(\max\{\bar{v}_r, v^*_r\}) = 1 \).

**Proof.** The only form of pooling in a D1 equilibrium is either on \( v = 0 \) or \( v = 1 \) (Cho & Sobel 1990, p. 395). There is no pooling on \( v = 0 \) here, because \( U_r(\bar{v}_r, 1) \geq U_r(0, q) \) for all \( q \geq q_2 \). In addition, there is no pooling on \( v = 1 \). Otherwise, both types would have a profitable deviation to \( v = 0 \) as \( U_i(0, 0) \) is a finite constant, whereas \( \lim_{v \to 1} U_i(v, 0) = -\infty \) because \( \lim_{v \to 1} c(v) = \infty \) by assumption.
In this case, Cho & Sobel (1990, p. 399) show that D1 selects the Pareto-dominant separating equilibrium, which is determined here as follows.

**Case 1:** $q_2 \leq q < \tilde{q}$. In a separating equilibrium, each type can do no better than by choosing their perfect information optimum, $v_i$, with probability one. As $q < \tilde{q}$, a secular type is ‘envied’ and can do no better than her equilibrium payoff $U_s(\bar{v}_s, 0)$, under any beliefs. This means that there does not exist a value $v^*_s \in [0, 1]$ which solves $U_s(\bar{v}_s, 0) = U_s(v^*_s, 1)$, so we set $v^*_s = 0$. It also implies that we only need to check incentive compatibility for religious types. As $q \leq \tilde{q}$ in the case under consideration, incentive compatibility holds because $v^*_s = 0$ and we have already shown that $U_r(\bar{v}_r, 1) > U_r(0, 0)$ in this case. Therefore, strategies are indeed $\sigma^*_s(v_s) = 1$ and $\sigma^*_r(v_r) = 1$ in the unique D1 equilibrium.

**Case 2:** $q \geq \tilde{q}$. For this case, we only need to check incentive compatibility for secular types. If $U_s(\bar{v}_s, 0) > U_s(\bar{v}_r, 1)$, then the unique D1 equilibrium once again involves $\sigma^*_s(\bar{v}_s) = 1$ and $\sigma^*_r(\bar{v}_r) = 1$.

If $U_s(\bar{v}_s, 0) < U_s(\bar{v}_r, 1)$, then the Pareto-dominant separating equilibrium involves religious types increasing veiling to $v^*_r > \bar{v}_r$, which is the value which makes secular types indifferent between choosing $v^*_s$ and mimicking religious types.

All that remains is to show that there exists a unique such value $v^*_r$. We can rewrite $U_s(\bar{v}_s, 0) = U_s(v^*_r, 1)$ as:

$$U_s(\bar{v}_s, 0) - U_s(v^*_s, 0) = S(v^*_r, 1) - S(v^*_s, 0). \tag{28}$$

First consider the case in which $q = \tilde{q}$. Then $S(v^*_r, 1) - S(v^*_s, 0)$, so that the RHS of (28) is zero. Therefore, $v^*_r = \bar{v}_s = 0$.

For $q > \tilde{q}$, the right-hand side of (28) is positive. The left-hand side equals zero at $v^*_r = \bar{v}_s$. As $v \to 1$, $U_s(v, 1) \to -\infty$, because $c(v) \to \infty$. Therefore, the left-hand side goes to infinity as $v^*_r \to 1$. We claim that $U_s(v, 0)$ is strictly decreasing in $v$ for all $v > \bar{v}_s$. Therefore, for each $q > \tilde{q}$, there exists a unique value $v^*_r \in (\bar{v}_s, 1)$ that solves $U_s(\bar{v}_s, 0) = U_s(v^*_r, 1)$. We shall now establish the claim.

Recall that $U_s(v, 1)$ is strictly decreasing in $v$ for all $v$ when $q < \bar{q}$ (see proof of Proposition 2(ii)). In addition, $\frac{\partial U_s(v, 0)}{\partial v} |_{v=\bar{v}_s} = 0$, and by differentiation $U_s(v, 0)$ is strictly concave in $v$ when $q \geq \bar{q}$. Therefore, $U_s(v, 1)$ is strictly decreasing in $v$ for all $v > \bar{v}_s$.

This establishes the claim and indeed the Lemma. □
Proof of Proposition 4. Suppose $\overline{\pi}_r > 0$ and $\overline{\pi}_s > 0$. Let us first derive the comparative statics results for $\overline{\pi}_r$ and $\overline{\pi}_s$ by computing the cross-partial derivatives of (6) in the perfect information case [the associated first-order conditions are given by (12) and (15)]:

Table 1: Cross-partial derivatives under perfect information

<table>
<thead>
<tr>
<th></th>
<th>$i = r$</th>
<th>$i = s$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\frac{\partial U_s}{\partial v q}$</td>
<td>$-\alpha p g'(v)[\lambda_r + \lambda_s]$</td>
<td>$-\alpha p g'(v)[\lambda_r + \lambda_s]$</td>
</tr>
<tr>
<td>$\frac{\partial U_s}{\partial v p}$</td>
<td>$-\alpha g'(v)[(1+q)\lambda_r - (1-q)\lambda_s]$</td>
<td>$-\alpha g'(v)[q \lambda_r - (2-q)\lambda_s]$</td>
</tr>
<tr>
<td>$\frac{\partial U_s}{\partial v \lambda r}$</td>
<td>$-\alpha p g'(v)(1+q)$</td>
<td>$-\alpha p g'(v)q$</td>
</tr>
<tr>
<td>$\frac{\partial U_s}{\partial v \lambda s}$</td>
<td>$\alpha p g'(v)(1-q)$</td>
<td>$\alpha p g'(v)(2-q)$</td>
</tr>
</tbody>
</table>

Recall that $g(v) < 0$ for all $v$, by assumption. It is straightforward to sign the derivatives in Table 1 by inspection, except for those associated with $p$. From the third row of Table 1, $\frac{\partial U_s}{\partial v p} > 0$ if and only if $(1+q)\lambda_r - (1-q)\lambda_s > 0$, which implies $q > \frac{\lambda_r - \lambda_s}{\lambda_r + \lambda_s}$. By Proposition 2(i), this holds if $\overline{\pi}_r > 0$. Therefore, when positive, $\overline{\pi}_r$ is strictly increasing in $p$.

In addition, $\frac{\partial U_s}{\partial v p} > 0$ if and only if $q \lambda_r - (2-q)\lambda_s > 0$, which implies $q > \frac{2\lambda_r}{\lambda_r + \lambda_s}$. By Proposition 2(ii), this holds if $\overline{\pi}_s > 0$. Therefore, when positive, $\overline{\pi}_s$ is also strictly increasing in $p$.

We can now derive the comparative statics results for $v_r^*$, when $v_r^* > 0$. Recall that in this case $v_r^*$ is defined as the solution to:

$$U_s(\overline{\pi}_s, 0) = U_s(v_r^*, 1)$$

$$\iff U_s(\overline{\pi}_s, 0) - U_s(v_r^*, 0) + S(v_r^*, 0) - S(v_r^*, 1) = 0$$

$$\iff \alpha p [g(\overline{\pi}_s) - g(v_r^*)] ((2-q)\lambda_s - q \lambda_r) + [c(v_r^*) - c(\overline{\pi}_s)] - (1-\alpha)(q \lambda_r - (1-q)\lambda_s) = 0.$$  \hspace{1cm} (29)

Before differentiating the equation, note that $\frac{\partial U_s(v, 0)}{\partial v}|_{v=\overline{\pi}_s} \frac{\partial \overline{\pi}_s}{\partial \theta} = 0$, where $\theta$ represents a parameter. If $\overline{\pi}_s > 0$, then $\frac{\partial U_s(v, 0)}{\partial v}|_{v=\overline{\pi}_s} = 0$. If $\overline{\pi}_s = 0$, then $\overline{\pi}_s$ is unresponsive to a small parameter change, so that $\frac{\partial \overline{\pi}_s}{\partial \theta} = 0$.

Now define $K \equiv -\frac{dU_s(v, 0)}{dv}|_{v=\overline{\pi}_s}$. By implicit differentiation of (29), we can derive the following results:

We claim that $U_s(v, 0)$ is strictly decreasing in $v$ for $v > \overline{\pi}_s$, so that $K > 0$. To establish the claim first recall that when $q < \overline{q}$, $U_s(v, 0)$ is strictly decreasing in $v$ (see proof of Proposition 2(ii)). When $q \geq \overline{q}$, $U_s(v, 0)$ is strictly concave in $v$ (by differentiation).
Table 2: Comparative Statics under imperfect information

<table>
<thead>
<tr>
<th>$\frac{d\sigma}{dv}$</th>
<th>$K^{-1}{(1-\alpha)+\alpha p[g(\sigma_r)-g(v^*_r)]}(\lambda_r+\lambda_s)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\frac{d\sigma}{dp}$</td>
<td>$K^{-1}\alpha<a href="q%5Clambda_r-(2-q)%5Clambda_s">g(\sigma_r)-g(v^*_r)</a>$</td>
</tr>
<tr>
<td>$\frac{d\sigma}{\pi_r}$</td>
<td>$K^{-1}q{(1-\alpha)+\alpha p[g(\sigma_r)-g(v^*_r)]}$</td>
</tr>
<tr>
<td>$\frac{d\sigma}{\alpha}$</td>
<td>$-K^{-1}{(1-\alpha)(1-q)+\alpha p<a href="2-q">g(\sigma_r)-g(v^*_r)</a>}$</td>
</tr>
</tbody>
</table>

Together with the fact that $\frac{\partial U_s(v,0)}{\partial v}|_{v=\overline{v}_s}=0$, this implies that $U_s(v,0)$ is strictly decreasing in $v$ for all $v > \overline{v}_s$. Therefore, $K > 0$.

By inspection of table 2 then, the first and third entries are positive and the fourth entry is negative. The second entry is positive if and only if $q > \overline{q} = \frac{2\lambda_s}{\lambda_r+\lambda_s}$. This establishes the Proposition. □

Proof of Proposition 5. The ‘inflow’ at time $t$ to the pool of religious types is $(1-q^t)\alpha[1-pg(\overline{v}_s)]$, i.e. the proportion of secular types in the community times the probability that a secular type becomes a religious type during the period. Similarly, the outflow from the pool of religious types is $q^t\alpha p[\sigma^*_r(0)g(0)+(1-\sigma^*_r(0))g(\text{max}\{\overline{v}_r,v^*_r\})]$. Therefore:

\[
q^{t+1} = h(q^t) \equiv q^t + (1-q^t)\alpha[1-pg(\overline{v}_s)] - q^t\alpha p[\sigma^*_r(0)g(0)+(1-\sigma^*_r(0))g(\text{max}\{\overline{v}_r,v^*_r\})],
\]

where $h$ is a real-valued function of $q^t$.

In a steady state, $q^{t+1} = q^t$. This implies:

\[
q^t = \frac{1-pg(\overline{v}_s)}{p[\sigma^*_r(0)g(0)+(1-\sigma^*_r(0))g(\text{max}\{\overline{v}_r,v^*_r\})]+(1-pg(\overline{v}_s))}. \tag{31}
\]

(i)-(ii) We shall now show that at least one such steady state exists. Recall that $p \in (0,1)$ and $g(v) \in (0,1)$ by assumption. Therefore, $h(q^t) \in (0,1)$ for all $q^t$. Hence $q^t = 0 < h(0)$ and $q^t = 1 > h(1)$, so that all equilibria are interior. In addition, $h(q^t)$ is continuous in $q^t$, because $\sigma^*_r(0)$, $\overline{v}_s$, $\overline{v}_r$ and $v^*_r$ are continuous in $q$ [by Lemma 4 and Proposition 4]. Taken together this implies that there exists at least one $q^t$ such that $q^t = h(q^t)$ and where $h(q^t)$ cuts the 45° line from above (and hence is Lyapunov stable).

(iii) We shall now demonstrate that the process converges to a steady state from every initial state. First we shall establish that $h$ is strictly increasing. By (30), differentiating
h(q) with respect to q, we have:

\[
\frac{dh(q)}{dq} = 1 - \alpha [1 - pg(\bar{v}_s)] - \alpha p [\sigma_r^*(0)g(0) + (1 - \sigma_r^*(0))g(\max\{\bar{v}_r, v_r^*\})] \\
- (1 - q')\alpha pg'(\bar{v}_s)\frac{d\overline{v}_s}{dq} - q'\alpha p(1 - \sigma_r^*(0))g'(\max\{\bar{v}_r, v_r^*\})\frac{d\max\{\bar{v}_r, v_r^*\}}{dq} \\
- q'\alpha \frac{d\sigma_r^*(0)}{dq} [g(0) - g(\max\{\bar{v}_r, v_r^*\})].
\]  

(32)

The sum of the first two terms on the RHS of (32) is:

\[
1 - \alpha [1 - pg(\bar{v}_s)] - \alpha p [\sigma_r^*(0)g(0) + (1 - \sigma_r^*(0))g(\max\{\bar{v}_r, v_r^*\})] \\
= 1 - \alpha + \alpha p [g(\bar{v}_s) - \sigma_r^*(0)g(0) - (1 - \sigma_r^*(0))g(\max\{\bar{v}_r, v_r^*\})],
\]  

(33)

which is positive since \(\alpha < 1\), \(g(\bar{v}_s) \geq g(\bar{v}_r)\) (because \(g'(v) < 0\) and \(\bar{v}_r \geq \bar{v}_s\)) and \(\sigma_r^*(0) > 0\) only if \(\bar{v}_s = 0\) by Lemma 4.

The third and fourth terms are positive since \(g'(v) < 0\), \(\frac{d\sigma_r^*}{dq} > 0\) and \(\frac{d\bar{v}_s}{dq} > 0\) for \(i = r, s\) by Proposition 4. Except in a hybrid equilibrium, \(\sigma_r^*\) does not depend on \(q\), so the final term is zero in this case. In a hybrid equilibrium, the final term equals \(-q'\alpha \frac{d\sigma_r^*(0)}{dq} [g(0) - g(\bar{v}_r)]\). This is positive, since \(db/dq < 0\) by Lemma 4, and \(\bar{v}_r > 0\) in a hybrid equilibrium, so that \(g(0) > g(\bar{v}_r)\).

This establishes that \(h\) is strictly increasing. Now we can depict the direction of motion of the process, as in Figure 4. Whenever \(h(q')\) lies above the 45° line, \(q^{t+1} = h(q') > q^t\), and \textit{vice versa}.

To prove convergence, consider an initial state \(q^0\) in which \(q^0 < h(q^0)\), without loss of generality. Therefore, \(q^0 < h(q^0) = q^1\). As \(h\) is strictly increasing, \(q^1 = h(q^0) < h(q^1) = q^2\). Iterating this argument, \(q^{t+1} > q^t\) for all \(t \geq 0\). Every monotonic sequence on a compact set has a limit. Therefore, \(q^t \rightarrow \hat{q}\). As \(h\) is continuous, this implies \(h(q^t) \rightarrow h(\hat{q})\). Note that \(h(q^t) = q^{t+1} \rightarrow \hat{q}\). Therefore, \(\hat{q} = h(\hat{q})\), which is a steady state. \(\square\)

\textbf{Proof of Proposition 6}. Let the process begin in a steady state under unrestricted veiling denoted by \(q^0\). By hypothesis, both types integrate and religious types choose a positive degree of veiling with probability one. Denote equilibrium veiling for each type by \(\bar{v}_r\) and \(\bar{v}_s\), respectively.

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As both types integrate, community members learn nothing about an agent’s type from her integration decision. Denote beliefs regarding an agent’s type by $\beta(v, \ell)$. The equilibrium beliefs at $t = 0$, $\beta^0(\hat{v}_r, 1) = 1$ and $\beta^0(\hat{v}_s, 1) = 0$, then follow from Proposition 3 for the case $q \geq q_2$ (this is the case in which religious types choose positive veiling with probability one).

Set $\delta$ such that the probability that each agent acquires secular values in a cultural transmission phase if they segregate is lower than if they integrate, i.e. $\delta < pg(\hat{v}_r)$. There exists such a $\delta$ because $p > 0$ and $g(v) > 0$ for all $v$, by assumption. This means that segregation acts as an increase in veiling so that religious types benefit more than secular types from segregation. Therefore, community members assign belief $\beta^0(., 0) = 1$ upon observing segregation.

As religious types integrate in the initial state at $t = 0$, their equilibrium payoff must be higher than the payoff from segregation:

$$y + U_r(\hat{v}_r, 1) \geq \tilde{U}_r(1).$$

(34)

Now introduce a ban on veiling during $t = 1$, so that agents who integrate are restricted to zero veiling. Beliefs under restricted veiling are denoted by $\tilde{\beta}(\ell)$. It is straightforward, but tedious, to show that for each $q$ there exists a unique D1 equilibrium, in this case. We shall demonstrate here that given $q^1$ there exists a value $y$ such that the equilibrium involves secular types continuing to integrate with probability one and religious types segregating with probability one. In this case, equilibrium beliefs at $t = 1$ are $\tilde{\beta}^1(1) = 0$ and $\tilde{\beta}^1(0) = 1$. Religious types segregate if $y$ is sufficiently low as follows:

$$y + U_r(0, 0) < \tilde{U}_r(1).$$

(35)
Therefore, religious types switch from integration to segregation if:
\[
\bar{U}_r(1) - U_r(\bar{v}_r, 1) \leq y < \bar{U}_r(1) - U_r(0, 0). \tag{36}
\]

There exists such a \( y \) if:
\[
U_r(\bar{v}_r, 1) > U_r(0, 0). \tag{37}
\]

Suppose (37) does not hold. Then religious types would have a profitable deviation to \((v, \ell) = (0, 1)\) at \( t = 0 \), yielding a payoff of \( U_r(0, 0) \). [Note that because \( \bar{v}_r > 0 \) and secular types benefit more from reducing veiling, \( \beta^0(0, 1) = 0 \) under D1]. By hypothesis, however, \((v, \ell) = (\bar{v}_r, 1)\) is the equilibrium strategy for religious types at \( t = 0 \), a contradiction. Therefore, there exists a \( y \) such that religious types switch from integration to segregation.

In addition, because religious types benefit more from segregation than secular types, we can choose \( y \) such that secular types continue to integrate.

The inflow to the pool of religious types during \( t = 1 \) is then \((1 - q^1)\alpha(1 - pg(0))\) and the outflow is \( q^1\alpha\delta \). Therefore,
\[
q^2 = \tilde{h}(q^1) \equiv q^1 + (1 - q^1)\alpha(1 - pg(0)) - q^1\alpha\delta, \tag{38}
\]
where \( \tilde{h} \) is strictly increasing \([\tilde{h}'(q^1) = 1 - \alpha + \alpha(pg(0) - \delta) > 0] \).

We claim that \( q^2 > q^1 \). From (38), this occurs if:
\[
(1 - q^1)\alpha(1 - pg(0)) > q^1\alpha\delta, \tag{39}
\]
or:
\[
q^1 < \frac{1 - pg(0)}{\delta + (1 - pg(0))}. \tag{40}
\]

To establish that (40) holds, recall that, as \( q_1 \) is a steady state (i.e. \( q^1 = q^0 \)), in which \( \sigma^*_r(\bar{v}_r) = 1 \), (31) implies:
\[
q^1 = \frac{1 - pg(\bar{v}_s)}{pg(\bar{v}_r) + (1 - pg(\bar{v}_s))}. \tag{41}
\]

Therefore, we require the RHS of (40) to be greater than the RHS of (41). As \( \delta \to 0 \), the RHS of (40) goes to one, which is greater than \( q^1 \) (all religious equilibria are interior by Proposition 5). Therefore, \( q^2 > q^1 \) for \( \delta \) sufficiently small.

Now consider play during \( t = 2 \).

Case 1: Secular types integrate with probability one. We claim that religious types continue to segregate. To establish this claim, it is sufficient to show that the difference
between the payoff from segregation and integration is increasing in \( q \) for both types. This can be demonstrated as follows:

\[
\frac{d}{dq} \left( \tilde{U}_i(1) - U_i(0, 0) \right) = \alpha \delta (z_{rs} - z_{ss}) + [(1 - \alpha) + \alpha(1 - \delta)] (z_{rr} - z_{sr}) \\
- [(1 - \alpha) + \alpha \rho g(0)] (z_{rs} - z_{ss}) - \alpha (1 - \rho g(0)) (z_{rr} - z_{sr}),
\]

which is positive if:

\[
\alpha [\rho g(0) - \delta] (\lambda_r + \lambda_s) > -(1 - \alpha) (\lambda_r + \lambda_s).
\]

This holds because \( \rho g(0) > \delta \) by construction, so that the LHS is positive. Therefore, if religious types segregated in period 1, they continue to segregate in period 2, when secular types integrate.

Hence, \( q^3 = \tilde{h}(q^2) > \tilde{h}(q^1) = q^2 > q^1 \) because \( \tilde{h} \) is strictly increasing.

**Case 2:** Secular types segregate with positive probability. If secular types weakly prefer segregating to integrating, then religious types are strictly better off segregating. Let secular types segregate with probability \( d \). Then:

\[
q^3 = q^2 + (1 - q^2) \alpha [d(1 - \delta) + (1 - d)(1 - \rho g(0))] - q^2 \alpha \delta,
\]

which is greater than \( \tilde{h}(q^2) \) [because \( \delta < \rho g(0) \)], which we have shown is greater than \( q^1 \).

Therefore, in both cases \( q^3 > q^1 \).

Recall that the difference in the payoffs from segregating and integrating is increasing in \( q \) for both types by (42). Hence if secular types choose to segregate with probability \( d \) in period \( t \) and \( q^{t+1} > q^1 \), then they segregate with probability at least \( d \) in period \( t + 1 \).

Therefore, for periods \( t > 2 \), we can iterate the reasoning used for \( t = 2 \) to demonstrate that \( q^t > q^1 \) for all \( t > 1 \). \( \Box \)