Resisting Education

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Abstract

We develop a model in which individuals choose education to improve their earnings and regulate the cultural traits they acquire via social transmission. When education makes individuals more receptive to mainstream culture, minority groups underinvest in education as a form of cultural resistance. Economic and cultural incentives interact in surprising ways that increase income inequality. An increase in the skill premium induces low-ability minority types to reduce education—a phenomenon we call *resisting education*. The model links technological progress, globalization and anti-discrimination policies (e.g. affirmative action, Jewish emancipation) to oppositional attitudes toward education.

Key words: Education; identity; inequality; cultural transmission; oppositional behavior;

JEL classification: D10; D63; D71; I24 ; J24 ; Z12 ; Z13

1 Introduction

There is a voluminous literature on human capital and its role in economic development (e.g. Schultz 1961, Becker 1975, Lucas 1988, Mankiw et al. 1992). In recent decades, skill-biased technological change and globalization have raised returns to education in developed economies (Berman et al. 1998, Acemoglu 2002, 2003, Autor et al. 2003, Acemoglu & Autor 2011, Autor & Dorn Forthcoming).[1] At the same time, public spending on education has increased significantly in real terms.[2] Yet there has not been a uniform increase in educational attainment in countries such as the United States or the UK; in particular, educational outcomes have not converged as much as expected for certain minority groups (Katz & Goldin 2008). This paper provides one possible explanation for this pattern of education.

We develop a model in which education is shaped by both economic and cultural incentives. Education both improves earnings and regulates the cultural traits individuals acquire via social transmission. Two types of traits—mainstream and minority—are transmitted from person-to-person via social contact, similar to Bisin & Verdier (2000, 2001). The principal idea developed in this paper is that education makes an individual more receptive to acquiring the mainstream trait. Individuals with the minority trait underinvest in education (either for themselves or for their children) relative to mainstream types and relative to the benchmark case in which education has no cultural effect. This provides an explanation for why educational outcomes vary by ethnicity, class and religion.

Economic and cultural incentives interact in surprising ways. An increase in the skill premium induces some individuals to increase investment in education. This makes them more receptive to mainstream culture, causing the mainstream trait to proliferate. Low ability minority types, who benefit least from the rising skill premium, reduce education in response to the increased risk of acquiring the mainstream trait via social transmission. This phenomenon, which we call *resisting education*, is individually rational; it does not emerge as a result of inefficient group norms. In addition, a rise in the skill premium reduces welfare for some minority types and increases welfare for all individuals with the mainstream cultural

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[1]Correcting for ability bias, the returns to an additional year of schooling are approximately 6–10 percent (Angrist & Krueger 1992, Psacharopoulos 1994, Heckman et al. 2006, Leigh & Ryan 2008).

[2]Government expenditure on public education in the US increased from 5.1 percent of GDP in 1991 to 5.5 percent of GDP in 2008. In the UK it increased from 4.8 percent to 5.4 percent in the same period (*World Development Indicators* 2008).

trait.

The model we develop provides an explanation for a number of puzzles that are difficult to reconcile with conventional models of education. Technological change and globalization have led to an increase in the skill premium in recent decades. However, as Katz & Goldin (2008) document, levels of educational attainment in the US have not responded uniformly, as both human capital and signaling would suggest. In our model, worsening educational outcomes for disadvantaged members of minority groups is a natural consequence of rising returns to education. This has important implications as the global increase in the skill premium since the 1980s has been linked to rising income inequality (Katz & Murphy 1992, Juhn et al. 1993, Acemoglu 2002). Cultural incentives for resisting education in our model generate educational polarization and thereby amplify the effect of a rising skill premium on economic inequality.

The poor educational performance of minority groups in our model is not the consequence of discrimination. It is the product of cultural resistance. In fact, recognizing that various anti-discrimination measures serve to increase the skill premium for members of minority groups opens up a range of applications for our model. The civil rights movement in the US and the introduction of affirmative action, the breakdown of the class system in Britain and Jewish emancipation in 19th century Europe were all followed by the rise of oppositional cultures that denigrated (mainstream) educational achievement. These include the stigma attached to 'acting white' in African American communities, the development of anti-education attitudes among the white working class in Britain, and resistance to secular education among the Amish and ultra-Orthodox Jews. The emergence of these movements in the midst of rising returns to education is puzzling. Our theory provides a unified explanation for these seemingly disparate movements.

Our approach is related to both the economics of identity (Akerlof & Kranton 2000, 2002, Fang & Loury 2005, Austen-Smith & Fryer 2005), cultural transmission (Bisin & Verdier 2000, 2001), as well as the literature on affirmative action (Coate & Loury 1993a,b).[3] Akerlof & Kranton (2002) propose that minority students, whose ascriptive characteristics differ significantly from the mainstream, find it hard to fit into a school's status system and may thus reject it.[4] Coate & Loury (1993b) examine how affirmative action can affect stereotypes

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[3]For a survey of the cultural transmission literature, see Bisin & Verdier (2011).

[4]In Akerlof & Kranton (2002) it is assumed that students who reject the school's status system face

of minority groups in the presence of statistical discrimination; they show that, in some circumstances, anti-discriminatory policies can reinforce self-fulfilling negative perceptions of a minority group. Austen-Smith & Fryer (2005) develop a two-audience signaling model of "acting white" in which individuals pool on lower levels of education than they otherwise would to signal favorable social traits and avoid peer group rejection. Eguia (2013) proposes an alternative explanation in which members of an advantaged group choose a level of discrimination to screen out low-ability members of the disadvantaged group. Since high-ability individuals generate positive externalities, the disadvantaged group penalizes high-ability coethnics for academic success to miminimze outmigration.

Jensen & Miller (2011) also analyze strategic underinvestment in education. In their model, education increases an individual's productivity, but also makes them more likely to migrate to a city. Thus parents face a tradeoff when choosing their children's education. Rising returns to education in the city induce parents to reduce the education of children whom they want to stay at home and increase the education of children whom they want to migrate.[5] A field experiment in India finds support for this prediction, particularly for boys whose parents report a strong preference for them remaining at home.

None of these papers study the role of cultural transmission in shaping minority identity. An exception is Zenou & Sáez-Martí (2012) who focus on the cultural transmission of a work ethic and how it is affected by discrimination. They find that discrimination can be self-fulfilling if it induces a minority group not to invest in a work ethic. Our approach is different; we do not propose a 'culture of poverty' argument. The results we generate do not require the transmission of good and bad cultural traits that respectively increase and depress individual productivity, such as a work ethic. Rather we study the transmission of cultural identity, which is valued in itself by individuals and has no direct economic effect. We show that these cultural incentives interact in unexpected ways with standard economic incentives.

The remainder of the paper is structured as follows. In Section 2, we briefly motivate our central idea that education makes individuals more receptive to mainstream values. The model is introduced and analyzed in Section 3. Section 4 explores various applications of our model and Section 5 concludes.

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social pressure to choose a lower level of education.

[5]Kondo (2012) also studies this trade-off in an overlapping generations setting.

2 Motivation

2.1 Education Shapes Culture

The approach we employ builds on the natural assumption that education shapes one's culture and identity. This notion is not new. When widespread public education was introduced in 19th century Europe, the express purpose of policymakers was to undermine old regional, class-based, and ethnic identities, to produce citizens who would be willing and able to contribute to the nation.[6] Weber (1976) documents the case of late nineteenth century France when in the Third Republic a 'vast program of indoctrination was plainly called for to persuade people that the fatherland extended beyond its evident limits to something vast and intangible called France' (Weber 1976, 333). He notes that:

> 'At the very start of school, children were taught that their first duty was to defend their country as soldiers . . . Commencement speeches recalled this sacred duty in ritual terms—our boys will defend the soil of the fatherland. The whole school program turned on expanding the theme. Gymnastics were meant "to develop in the child the idea of discipline, and prepare him ... to be a good soldier and a good Frenchman" . . . 'Teachers taught or were expected to teach "not just for the love of art or science ... but for the love of France"' (Weber 1976, 334-336).[7]

There is some prior work in economics on this kind of positive spillover from education. Gradstein & Justman (2002) develop a model in which education leads to economic growth by reducing the cultural distance between different groups. Dixit (2009) develops a model in which parents can invest in education for their children in order to instill pro-social preferences. Empirical evidence indicates that education reduces crime (Lochner & Moretti 2004), increases voting turnout and support for freedom of speech (Dee 2004) and generally improves civic engagement (Milligan et al. 2004, Glaeser et al. 2007).[8]

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[6] For a discussion of the motivations of policymakers in implement these educational reforms see Alesina & Reich (2013).

[7] Revisionist historians see the early American public education system as cultivating values of conscientiousness, time-keeping, and self-discipline that were required for capitalist production (see Bowles & Gintis 1976, Katz 1976). Lott (1999) documents how totalitarian governments provide large amount of public education.

[8] Acemoglu (1996), Benabou (1993, 1996) and Rauch (1993) model positive neighborhood effects in human capital accumulation while Borjas (1995) looks at how segregation can reduce education attainment

What has not been fully recognized by economists is that the positive externalities associated with education are often viewed as negative externalities from the perspective of minority groups or subcultures. Socialization into the majority culture often means partial de-socialization in the minority culture, the loss of traditional values and beliefs, and the undermining of local community attachments. For example, in the new public schools of late 19th century France, uses of regional dialects were prohibited and regional histories were replaced by national history (Weber 1976, 345). Even when indoctrination is not an explicit educational goal, mainstream education socializes children in the culture of mainstream society.

2.2 Educational Attainment among Minorities in the US and UK

Katz & Goldin (2008) review the history of American leadership in providing widespread access to high school and college education. Since the 1970s, however, educational attainment and performance in the United States has stagnated, even as the returns to education have increased. The performance of US students in international tests, as measured by the Program for International Student Assessment (PISA), has been 'relatively flat over the period 1969–1999' (Hanushek & Woessmann 2009, A4). In contrast, East Asian and northern European countries have improved their performance. In 2010 less than a third of US students achieved proficiency in mathematics compared to 58 percent in Korea and 56 percent in Finland (Peterson et al. 2011).[9]

Katz and Goldin link the overall stagnation in education attainment to increased inequality in educational outcomes. Why have significant portions of the population failed to respond to high returns to education? Katz and Goldin argue that 'schools are essentially failing particular students . . . mainly minority children' (Katz & Goldin 2008, 348). While they see this as a problem of funding and running inner-city schools for minorities, there is evidence that this phenomenon may also be related to issues of identity.

According to the 2010 PISA tests 50 percent of Asian Americans and 42 percent of white

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for minorities. Alesina & Reich (2013) consider the incentives rulers have to invest in indoctrinating their population.

[9]The US was 32nd out of 65 countries participating in PISA. In reading, the US came in 17th place with 31 percent of the students proficient. This score is considerably lower than that recorded for many East Asian countries and Finland but comparable to many European countries. Also see Hanushek & Woessmann (2008).

Figure 1: Educational Attainment by Race in the US
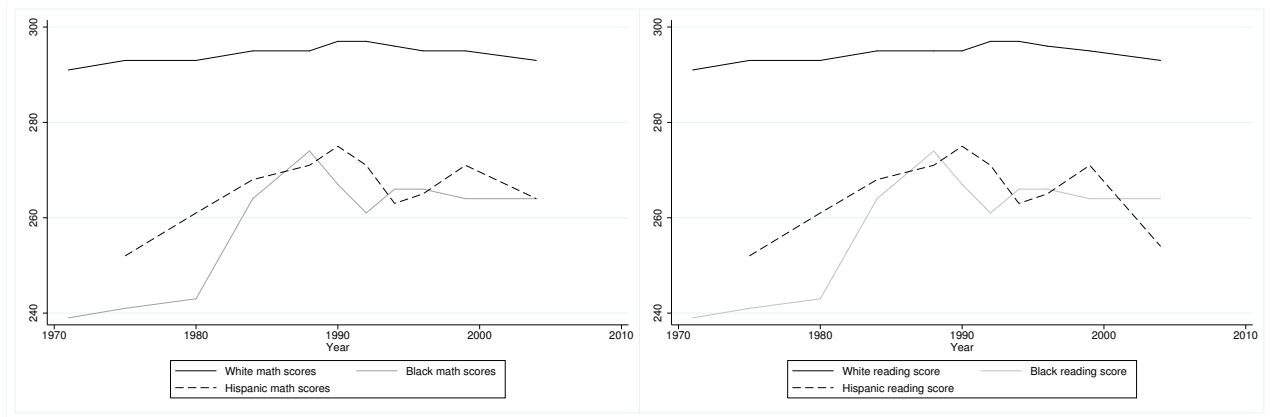
Average reading and mathematics scores at age 17 in the US from the National Assessment of Educational Progress. Scores range from 0-500. Data: KewalRamani et al. (2007).

Americans are proficient in mathematics compared to only 11 percent of African American and 15 percent of Hispanic American students (Peterson et al. 2011). The National Assessment of Educational Progress (NAEP) reports that while reading and mathematics scores for blacks and hispanics are higher than they were in the 1970s there has been stagnation in black and hispanic test scores since the 1990s (KewalRamani et al. 2007). The average reading level at age 17 for African Americans and Hispanics in 2004 was lower than in 1988 (264 for both groups compared to 274 and 271 respectively in 1988)—and considerably less than the score for whites (which was 293).[10] In mathematics, scores for minorities were also lower in 2004 than in 1990; the process of convergence with white scores seems to have ceased (Figure 1).

Part of the poor educational performance of minorities in the US is no doubt driven by economic factors such as school quality, parental education and income. However, one sees significant variation in educational attainment in the UK across groups, even when restricting attention to students who are eligible for free school meals (which controls for income and some other confounding variables). Except in the UK, it is white British students (eligible for free school meals) that do poorly.[11] Table 1 reports that among students eligible for free

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[10]In fact the score of black and Hispanic 17 year olds was lower than the average score for white 13 year olds.

[11]Children are eligible for free school meals if their parents are in receipt of income support, unemployment benefit or other forms of income-related employment support. In 2011, 1.2 million children were known to be eligible.

Table 1: Educational Performance among Poor British Students

Percentage of students eligible for free school meals
with 5 or more A*–C grades at GCSEs

White British	25.8
Black	39.1
South Asian	45.7
East Asian	68.4

Source: *DfE: GCSE and Equivalent Results in England, 2009/10* (2010). 5 A*–C GCSEs are typically required for students to attend university.

school meals, only 25.8 percent of 'white' students obtain the 5 or more A–C grades including English and Mathematics—usually required to attend university—compared to 39.1 percent of black students, 45.7 percent of 'Asian' (South Asian) students and 68.4 percent of 'Chinese' (East Asian) students between 2005 and 2010. Economic factors alone cannot explain this pattern of education. Educational underperformance among poor students in the UK is driven by class, rather than race-based identity. Another example is provided by Izama (2013) who studies educational outcomes in sub-Saharan Africa. She finds that Muslims acquire significantly less human capital than do Christians and that this effect is strongest in countries where Muslims comprise a small minority of the region. In the next section we develop a formal model that allows us to show how these, and other forms of educational underachievement, can be viewed as a form of cultural inoculation against the transmission of mainstream cultural traits.

3   A Model of Education and Cultural Transmission

Let us turn to our formal model. The main departure from conventional models of education is that education not only improves earnings, but also affects the social transmission of cultural traits. To focus on this cultural mechanism, we abstract from general equilibrium effects (Fang & Norman 2006), statistical discrimination (Coate & Loury 1993*b*), intergenerational transfers of ability and human capital (Borjas 1992, 1995), and other factors which have been the subject of prior work.

To fix ideas, we introduce a model in which parents choose their children's level of education, à la Bisin & Verdier (2000). In Section 3.1 we suggest an alternative and compatible

formulation in which children choose their own educational effort.

Society is composed of a continuum of parents with unit mass. Time is continuous and denoted by t. In each period t, a parent gives birth (asexually) to one child, learns the child's ability, chooses its level of education $e \in [0, 1]$ and then dies.

Education e yields an exogenous economic payoff of $F(e; a) = f(a)e^{\sigma} > 0$. The function F is our reduced-form model of the labor market. We assume that the elasticity $\sigma \in (0, 1)$, so that F is strictly increasing and strictly concave in e. We refer to the function $f(a)$ as the *return to education* and the parameter a as an agent's ability, but one can conceive of a more broadly as representing any exogenous variable that affects an agent's marginal return to education, including local school quality and ascriptive characteristics that form the basis for discrimination. Assume that f is continuous, positive and strictly increasing. A child's ability a is drawn from a continuous distribution with finite mean α and probability measure μ.[12] Each agent's ability draw is independent of her parent's ability and the ability of other agents in her generation. The support of μ is $(0, \bar{a})$. This formulation is consistent with a view of education as an investment in human capital and a signal of innate productivity.[13]

Education also has a (direct) cost ce, where $c > 0$. Thus far, we have a standard model of human capital acquisition. The point of departure in our model is that education also shapes the transmission of cultural traits.

Each parent is one of two cultural types $\theta \in \{M, m\}$. Proportion q_t of parents possess the *mainstream* trait M and proportion $(1 - q_t)$ of parents possess the *minority* trait m at the beginning of period t. During the period, children can acquire a different trait through the process of social transmission. Mainstream educational institutions in our model tend to make individuals more receptive to acquiring the mainstream trait via social contact. Independently of her initial cultural type, a child with education e in period t is matched with an M type with probability q_t, in which case she acquires the mainstream trait M with probability e. With probability $1 - q_t$, she is matched with a minority m type, in which case she acquires the mainstream trait M with probability $\frac{1}{2}e$.[14]

Parents are imperfectly empathetic toward their children, as in Bisin & Verdier (2000),

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[12] Qualitatively similar results can be derived for discrete distributions of a.

[13] Mailath (1987) demonstrates that separating equilibria are differentiable when the set of types is an interval.

[14] The results hold for any probability equal to be such that $b < 1$.

judging them based on their own preferences. Let us simply assume that a type θ parent receives a payoff of $\nu_\theta(M)$ if their child acquires the mainstream trait and $\nu_\theta(m)$ if their child acquires the minority trait. Define $\delta_\theta \equiv \nu_\theta(M) - \nu_\theta(m)$. We assume that $\delta_m < 0 < \delta_M$, viz., parents prefer children to acquire their own cultural trait.

For parents with the mainstream trait, education promotes their cultural identity, while the opposite is true for parents with the minority trait. By helping to transmit the mainstream trait, education can undermine the ability of minority parents to pass on their own trait to their children.

A type (a, θ) parent is a parent with trait θ who has a child with ability a. The expected total payoff to a type (a, θ) parent from choosing education e in period t is:

$$U(e; a, \theta, q_t) = F(e; a) - ce$$
$$+ [q_t e + (1 - q_t)\tfrac{1}{2}e]\nu_\theta(M) \tag{1}$$
$$+ \left[q_t(1 - e) + (1 - q_t)(1 - \tfrac{1}{2}e)\right]\nu_\theta(m).$$

This formulation is not chosen for its realism, but to make a point. Even when the economic and cultural incentives for education are additively separable, there can be interesting interactions between the two.

3.1   An Alternative Interpretation

The model can reformulated to support an alternative interpretation which we will employ at times in applying the model. Specifically, we can conceive of a child choosing to exert effort e on education. In this case, children want to retain the identity that they inherit and minority children trade off the economic benefits of education against the cultural cost of losing their inherited identity. We will continue to focus on the version in which parents choose education in the formal analysis.

3.2   The Optimal Level of Education

We can now characterize a parent's optimal choice of education for a fixed distribution of cultural traits q, given their child's ability a and their own cultural trait θ. For a type (a, θ)

parent this is given by the solution to the first-order condition:

$$\sigma f(a)e^{\sigma-1} = c - \tfrac{1}{2}\delta_\theta(1+q) , \qquad (2)$$

which implies that:

$$e^*(a,\theta,q) = \left(\frac{\sigma f(a)}{c - \tfrac{1}{2}\delta_\theta(1+q)} \right)^{\frac{1}{1-\sigma}} . \qquad (3)$$

For $e^*(a,\theta,q) < 1$, it is sufficient that $c - \delta_M > \sigma f(a)$. This condition also guarantees that $e^*(a,\theta,q) > 0$. Henceforth we shall impose this condition for convenience, though our qualitative results do not depend on it.

Our first proposition characterizes how educational choices vary with an individual's ability and cultural trait.

Proposition 1 *Fix a state q. For each type (a,θ) parent, there exists a unique optimal level of education $e^*(a,\theta,q)$ given by equation (2). Education choices are interior, $0 < e^*(a,\theta,q) < 1$ for all $a \in A$, $\theta \in \{M,m\}$ and $q \in [0,1]$.*

Optimal education is:

(i) strictly increasing in an agent's ability a,

(ii) strictly increasing in q for parents with the mainstream trait M,

(iii) strictly decreasing in q for parents with the minority trait m,

(iv) lower for parents with the minority trait m.

A few remarks are in order regarding the differences in educational choices by mainstream M and minority m types. Firstly, M type parents always choose a higher level of education because education reinforces their own cultural trait. In contrast, m type parents would like their children to acquire the m trait. Hence education imposes an additional cultural cost on minority parents, which induces them to underinvest in education relative to the benchmark case in which education does not affect the social transmission of traits (alternatively $\delta_m = 0$) and relative to M types. We view this underinvestment in education as a form of *cultural resistance*. In addition, the prevalence of the mainstream trait q has a different effect on

10

agents with mainstream and minority traits. An increase in q raises the risk of acquiring the M trait via social transmission. Minority parents, who want their children to retain the m trait, respond by decreasing their children's education in order to insulate them from this. The opposite is true for mainstream parents.

3.3   The Steady-State Distribution of Cultural Traits

We are now in a position to derive the steady-state distribution of cultural traits. Recall that the probability with which an agent who has education e acquires the mainstream trait is $q_t e + (1 - q_t)\frac{1}{2}e = \frac{1}{2}(1 + q_t)e$. Hence in the continuous-time limit the evolution of q is given by the following nonlinear differential equation:

$$
\begin{aligned}
\dot{q} &= (1 - q)\tfrac{1}{2}(1 + q)\hat{e} - q\big[1 - \tfrac{1}{2}(1 + q)\hat{e}\big] \\
&= \tfrac{1}{2}(1 + q)\hat{e} - q \,,
\end{aligned}
\tag{4}
$$

where $\hat{e}$ is the average level of education defined as follows:

$$
\begin{aligned}
\hat{e} &\equiv \int_0^{\bar{a}} \big[qe^*(a, M, q) + (1 - q)e^*(a, m, q)\big]\, d\mu \\
&= \left\{ q\left(\frac{\sigma}{c - \tfrac{1}{2}\delta_M(1 + q)}\right)^{\frac{1}{1-\sigma}} + (1 - q)\left(\frac{\sigma}{c - \tfrac{1}{2}\delta_m(1 + q)}\right)^{\frac{1}{1-\sigma}} \right\} \int_0^{\bar{a}} f(a)^{\frac{1}{1-\sigma}}\, d\mu.
\end{aligned}
\tag{5}
$$

Note that $\hat{e} \in (0, 1)$ because $e^*(a, \theta, q) \in (0, 1)$ for all $a \in A$, $\theta \in \{M, m\}$ and $q \in [0, 1]$ by Proposition 1.

Denote the RHS of (4) by $h(q)$. A steady-state distribution of traits, denoted by q^*, occurs where $h(q) = 0$. Recall that for q^* to be asymptotically stable, it must be that $h'(q^*) < 0$. We shall henceforth focus on the subset of steady states which are asymptotically stable.

Proposition 2 *There exists a smallest and largest asymptotically stable state, denoted by $\underline{q}$ and $\bar{q}$ respectively. Every steady state is interior, $0 < q^* < 1$.*

Therefore, every steady state is a polymorphic distribution of cultural traits, in which both agents with mainstream and minority traits are present in society. Multiple steady states

11

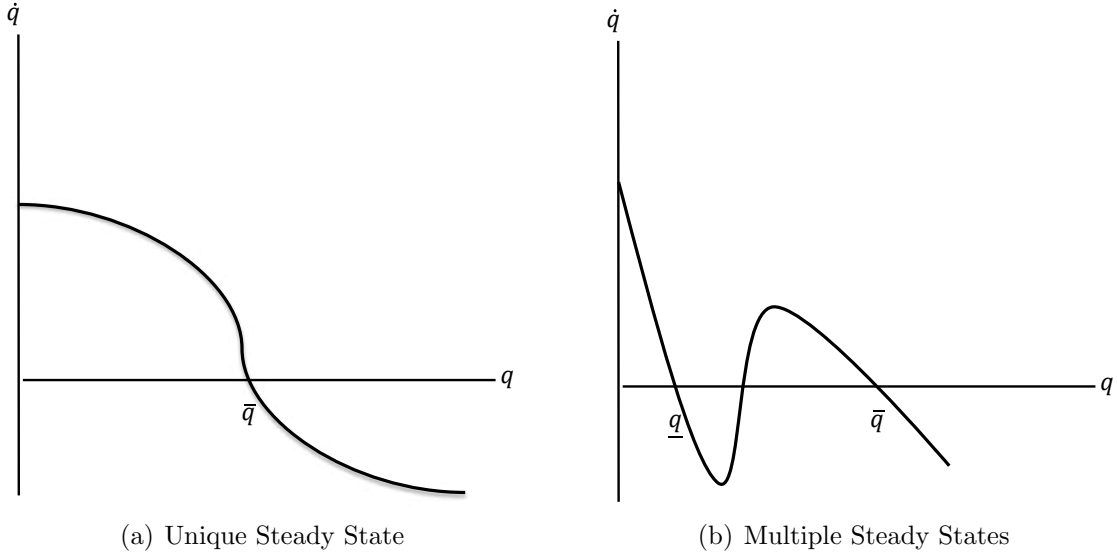(a) Unique Steady State (b) Multiple Steady States

Figure 2: The steady-state distribution of cultural traits

can exist and at least one is asymptotically stable. Examples with one and three steady states are depicted in Figure 2. When cultural transmission produces multiple steady states, a small increase in returns to education can have a large effect on educational choices.

3.4   Resisting Education

Let us now examine the effect of an increase in returns to education on the mean level of education and distribution of cultural traits. In particular, we consider a shift at some time T from the function f to g that retains the properties of f with a few key differences, the first being:

Dominance. $g(a) > f(a)$ for all $a \in (0, \bar{a})$.

That is, the shift to g means that everyone enjoys a higher marginal return to education.

Let the mean level of education at time t be $\hat{e}_t$. If f and g satisfy dominance, then we can state the following result:

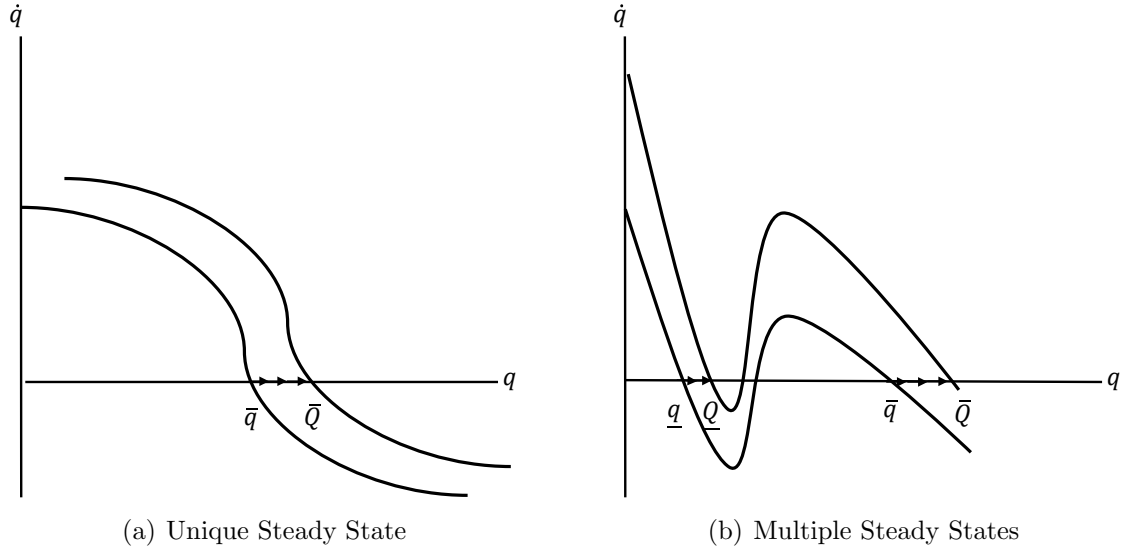**Proposition 3** *Let the process reside in an asymptotically stable steady state q^* at time T.*

12

(a) Unique Steady State (b) Multiple Steady States

Figure 3: The steady-state distribution of cultural traits

Suppose there is an increase in returns to education from f to g at time T. Then for all $t > T$, $q_t > q_T$ and $\hat{e}_t > \hat{e}_T$.

In other words, there is an immediate and permanent increase in the prevalence of the mainstream trait and the mean level of education after the increase in returns to education occurs.

An increase in returns to education induces a rise in the mean level of education, which in turn causes the mainstream trait to spread. Figure 3 depicts the corresponding shift in steady states. In canonical models of human capital acquisition, in which education only plays an economic role, every individual increases education in response to a rise in the skill premium. When education has both a cultural and economic role, however, a focus on average levels of education obscures surprising forms of heterogeneity in educational responses. Some types may resist the spread of the mainstream trait induced by the rise in the skill premium.

Definition 1 *(Resisting Education).* Type (a, θ) resists education at time $t > T$ if:

$$e^*(a, \theta, q_t, g) < e^*(a, \theta, q_T, f).$$

For this part of the analysis, we shall impose an additional condition on f and g:

13

Bias. $\lim_{a \to 0}[g(a) - f(a)] = 0$.

While everyone may enjoy a higher marginal return to education, this condition ensures that the increase is arbitrarily small for the lowest ability types. One can think of this as an increase in the skill premium, where benefits accrue primarily to high ability workers. When f and g satisfy dominance and bias, we can state the following result:

Proposition 4 *For all $t > T$, there exists a set of types with positive measure who resist education at time t. This set consists exclusively of agents with the minority trait.*

Hence there are always some minority types who respond to the increase in returns to education by resisting education. In contrast, all individuals with mainstream values increase education. The intuition for this result is as follows. As agents increase education, in response to the rise in returns to education from f to g, the mainstream trait spreads through the population (q rises). When the increase in returns to education exhibits 'bias', however, there are some ability types whose benefit from the shift to g is arbitrarily small. Such agents who hold the minority trait respond to the increased risk of acquiring the mainstream trait by reducing education. In contrast, mainstream types want their children to acquire the mainstream trait. The increase in q induces them to increase education, even when they receive no economic benefit from the shift to g.

We can say more about the set of agents who resist education if we replace the dominance condition with the following monotone likelihood ratio property (MLRP):

MLRP. If $a > a'$, then $f(a)/g(a) < f(a')/g(a')$.

When f and g satisfy MLRP and bias, we have the following result:

Corollary 1 *There exists a real number $\hat{a}_t \in (0, \bar{a}]$ such that type (a, θ) resists education in period t if and only $\theta = m$ and $a \in (0, \hat{a}_t]$.*

Hence it is the lowest ability types with the minority trait who resist education. Recall that ability in our model does not necessarily mean talent, but more broadly the ability to

benefit from rising returns to education, which may vary depending on factors such as the quality of public schools and local norms of discrimination. Hence, by identifying the types of individuals who resist education, Corollary 1 yields a further empirically testable prediction: *Individuals with the worst educational outcomes adopt even lower levels of education in response to a rise in the skill premium.*

Resisting education has natural consequences for trends in economic inequality. An increase in returns to education creates an exogenous increase in inequality. While improving average educational attainment, this also sets in motion cultural changes which lead to further polarization in educational outcomes. The original (exogenous) increase in economic inequality is thereby amplified, creating even greater inequality than in a homogeneous society with all mainstream types.

3.5   Opposing Education

Let us now turn our attention to the welfare implications of rising returns to education. Let V denote an agent's indirect utility.

Definition 2 *(Opposing Education). Type (a, θ) opposes education at time $t > T$ if:*

$$V(a, \theta, q_t, g) < V(a, \theta, q_T, f).$$

When f and g satisfy dominance and bias, we can state the following result:

Proposition 5 *For all $t > T$, there exists a set of types with positive measure who oppose education at time t. This set consists exclusively of agents with the minority trait. The set of types that oppose education at time time t is a proper superset of the set of types that resist education at time t.*

Consider a policy which raises the return to education from f to g. According to Proposition 5, when education affects cultural transmission, there are always some agents that would oppose this policy. The decline in welfare occurs even though all agents receive an economic benefit from the policy. There is also more opposition than one might expect. Not only

would all types who resist education oppose the policy, but so would some types who would choose a higher level of education due to the policy.

The intuition is as follows. An increase in the return to education comes at a cultural cost to minority types, because it leads to the spread of the mainstream trait via social transmission. Resisting education is a response aimed at reducing the risk of acquiring the mainstream trait by reducing one's investment in education. Part of the cultural cost imposed by a rise in q, however, cannot be neutralized by reducing education. Hence there are more types that are made worse off by a policy that increases returns to education than resist this increase.

When f and g satisfy MLRP and bias, we have the following result:

Corollary 2 *There exists a real number $\tilde{a}_t \in (\hat{a}_t, \bar{a}]$ such that type (a, θ) opposes education in period t if and only $\theta = m$ and $a \in (0, \tilde{a}_t]$.*

In this case, we can conclude that the worst off individuals—low ability minority types—are made worse off by rising returns to education.

4 Applying the Model

Poor educational outcomes among minority groups have been to difficult to reconcile with rising returns to education driven by globalization and skill-biased technological progress. In our model, these phenomena go hand in hand. Once we recognize that various anti-discrimination policies produce a higher skill premium for members of minority groups, a number of other applications of our model become apparent.

In this section, we apply our model to a series of puzzling phenomena, specifically the emergence of oppositional attitudes to mainstream education among: (i) African Americans following the civil rights movement and affirmative action; (ii) the white working class in the UK amidst the breakdown of the class system; and (iii) ultra-Orthodox Jews in the wake of Jewish emancipation in 19th century Europe.

4.1 Civil Rights, Affirmative Action & Acting White

The stigma attached to 'acting white' is one of the most prominent explanations for the persistent underperformance of African American and Hispanic minorities in the US. Fryer & Torelli (2010) find that African American students with high grade point averages (above 3.48) are systematically less popular among their peers than are white students with the same grades. Austen-Smith & Fryer (2005) use a signaling model to explain this phenomenon. Our model adds to this analysis by demonstrating that 'acting white' can be viewed as part of a general process that is driven by the fact that education involves cultural transmission.

The Civil Rights movement of the 1960s raised the returns to education for African Americans. Wilson reports that 'the efforts of corporations to recruit college-trained blacks increased sharply between 1965 and 1970. In fact, the average number of recruitment visits of representatives of corporations to predominantly black colleges rose from 4 in 1960 to 50 in 1965, climbing to 297 in 1970'.[15] During the 1980s, however, working class African Americans in the inner cities faced reduced economic opportunities due to deindustrialization and technological deskilling, while at the same time a rising, largely suburban, African American middle class emerged, which continued to benefit from both diminishing levels of discrimination and from skill biased technological change (Wilson 1978a, Wacquant & Wilson 1989). Thus, while African Americans in general stood to benefit from the ending of Jim Crow laws in the South, and other less visible forms of discrimination in the North, it was only the new black middle class that continued to experience higher wages and greater levels of educational attainment in the 1980s and 1990s. The majority of inner-city African Americans were *not* able to benefit from the increase in the skill premium that began in the 1980s (represented by a shift from f to g in our model).[16] Our model suggests that it was the widening gap between returns to education among African Americans that appears to have generated a cultural movement opposed to educational attainment.

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[15]'[S]chools such as Clark University, Atlanta University, and Southern University, to which no visits had been made in 1960, received in 1970, 350,510, and 600 corporate representatives, respectively. The vigorous recruitment of highly educated blacks by corporations is one of the principle reasons why the proportion of black male workers in white-collar positions increased from 16 to 24 percent from 1964 to 1974 (the proportion of white males in white-collar positions remained slightly over 40 percent during this period) with the greater portion of this increase occurring in the higher level technical, professional, and administrative positions (Wilson 1978b, 17).

[16]Wilson (1987) further argues that the rising affluence of the black middle class actually hurt those inner city communities that had previously relied on middle class African Americans to provide community-level public goods—an effect which would only strengthen the mechanism we identify in our theory.

Therefore, it is consistent with our theory that sociologists and ethnographers began to detect the emergence of a distinctive culture that penalized academic achievement within inner city black communities in the 1980s.[17] This is the 'acting white' norm documented by sociologists and analyzed by Austen-Smith & Fryer (2005). Our theory suggests that this is part of a more general cultural response to rising returns to education.

Our model also sheds light on the effectiveness of policies designed to increase levels of educational attainment among minorities. Affirmative action acts as an increase in the skill premium for a relatively small proportion of high ability African Americans and Hispanics, by enabling them to gain places at higher ranked universities.[18] An extensive academic literature studies the effect of affirmative action policies in the US both in theory and in practice.[19] Proponents of affirmative action in the 1960s and 1970s saw it as a temporary measure. One Supreme Court justice who supported the legality of affirmative action in 1978 stated that "I yield to no one in my earnest hope that the time will come when an affirmative action program is unnecessary and ... a relic of the past" and hoped that "within a decade at most, American society must and will reach a stage of maturity where acting along this line is no longer necessary" (quoted in Fang & Moro 2011, 164).

This was not to be. As apparent in Figure 1, racial differences in educational attainment (which narrowed during the 1960s and 1970s) have not shrunk since the 1980s. Our purpose here is not to assess the effectiveness of affirmative action nor to replace existing explanations for how affirmative action policies can generate adverse effects. Rather we suggest that our

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[17]The figures reported by Wacquant & Wilson (1989) for inner-city Chicago are dated, but indicative of the phenomenon we are describing. They report that a large fraction of the population in the poorest areas of Chicago had not graduated high school and of those a 'majority of 60.5 percent in the jobless category'. They note that 'a high school degree is a *conditio sine qua non* for blacks for entering the world of work, let alone that of the middle class. Not finishing secondary education is synonymous with economic redundancy' and that this condition describes a substantial proportion of the residents of poor black neighborhoods (Wacquant & Wilson 1989, 18).

[18]Schuck, summarizing a large literature, notes that 'even its proponents concede that only a very small fraction of the group can hope to take advantage of it. This is most obvious with selective college admission ... but it is bound to be true as well for employment that requires special job skills or a certain level of education ... affirmative action in admission to selective colleges and universities largely benefits students from middle-and upper-class families. This is hardly surprising, as these students are best equipped to apply to such competitive and costly schools. This pre-college advantage is then multiplied when these students, now graduates of the selective schools, go on to apply to selective professions and graduate programs and then proceed with their careers' (Schuck 2003, 175).

[19]See Holzer & Neumark (2000) for a review of the evidence, as well as Coate & Loury (1993a,b), Chan & Eyster (2003), Moro & Norman (2003), Fryer & Loury (2005b,a), Fang & Norman (2006), Fryer et al. (2007), Fang & Moro (2011).

theoretical framework provides an alternative and complementary mechanism for explaining why affirmative action has not been as successful as its proponents either hoped or expected. Affirmative action raises the returns to education predominantly for high ability minority types. As they increase education, in our model, the mainstream cultural trait spreads through the minority population (the mean level of education q increases by Proposition 3). As Proposition 4 predicts, those who benefit least from affirmative action may respond by reducing their level of education. In this way, our model suggests that affirmative action could further depress the educational outcomes and reduce the welfare of the most disadvantaged members of the minority group (Corollary 2).

4.2 Breakdown of Class Discrimination & White Working Class Culture in Britain

Another example that sheds light on the relationship between resisting education and the transmission of values between groups is provided by white working class attitudes to education in the UK.

Participation in higher education has long been seen as conflicting with traditional working class values (see Jackson & Marsden 1966). University enrollment in the UK lagged behind US levels throughout the twentieth century, as did the equivalent of high school attendance. Katz and Goldin note that '[b]y 1960 Great Britain was about 35 years behind the United States in the educational attainment of its high-school aged youth' (Katz & Goldin 2008, 26). Instead, Katz and Goldin emphasize that the British system focused on providing a high level of education to an elite (Katz & Goldin 2008, 28).[20]

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[20]Jackson & Marsden (1966) depict the cultural distance that existed between children who attended grammar school and those who did not in the 1960s and describe the tensions that arose between children and their parents. One mother recalls 'Our Alfred would be doing his homework in the front room, and his father wasn't a bit understanding. He'd make it in his way to go through that room as many times as he possibly could — to disturb him' (Jackson & Marsden 1966, 118). Working class children who attended grammar schools in the 1950s became suddenly 'self-conscious over accent, of their discovering that they actually had an accent'. Many children acquired middle-class 'B.B.C.' accents and these 'shifts in accent too play[ed] their part in loosening 'neighbourhood' ties, and it was as if the process continually gathered momentum and the breach grew wider. But accent, even if changed, was still a burden and created other difficulties. That it offended the neighbors and old friends goes almost without saying ('stuck up', 'speaks la-di-dah'), but this time it cut into the home and family life. Again the need was above all for 'tact', and there were children who became bilingual, speaking B.B.C. English at school but roughening up when they got home' (Jackson & Marsden 1966, 114).

Several important developments occurred after 1980. First, the returns to education increased in the UK, as elsewhere. Second, the traditional class system began to breakdown as more people self-identified as middle-class and, third, after 1990 there was a dramatic expansion in the number of university places. The proportion of the eligible population attending university in the UK correspondingly increased from 13% in 1980 to 33% in 2000 and 39% in 2010.

Standard theories of education predict that rising returns to higher education and cheaper access thereto would produce an increase in educational attainment. While average educational attainment has increased, not all communities within the UK were able to benefit equally from the increased provision of education; instead, educational outcomes have become more polarized. Children from working-class backgrounds remain heavily underrepresented, especially at elite universities.[21] Moreover, this problem is particularly concentrated among particular communities, notably the white working class as Table 1 indicates.

Our theory can account for this otherwise puzzling development. Proposition 4 predicts that some individuals will reduce their level of educational attainment in response to an increase in returns to education because they (or their parents) wish to preserve their cultural values. Archer et al. (2003) quote a student who states her reluctance to attend university in the following terms:

> Well my boyfriend keeps on telling this to me ... once I come into university I will start acting like a uni student, I will start talking like a uni student, I'll start reading the papers that they read, you know? [laughs] I'll start behaving properly like one. And will you be listening to radio stations and um watching different things on TV, that I don't watch now, you know? And I do find myself doing that. (Archer et al. 2003, 177)

This statement highlights the cultural threat posed by mainstream education which is central to our model. In this case, higher education is associated with a distinctly middle-class culture which working-class individuals find alienating.[22] This is particularly marked among young men. Surveys conducted in the UK suggest that within working class communities,

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[21]See Harris (2010) and Browne et al. (2010, 48-49).

[22]According to Archer et al. (2007): ' [h]igher education does not appear to offer working-class young people the space to 'feel myself' and/or to generate value through 'known' mechanisms.' (Archer et al. 2007, 232).

attending university is still 'overwhelmingly associated with negative, undesirable images of masculinity, encapsulated in stereotypes of students as socially inadequate men who enjoy study' (Archer et al. 2003, 180).

The increased prominence of a particular strand of white working class culture—often denoted as 'chav' culture in the popular media—provides an example of what we call resisting education.[23] A 'Chav' dresses a certain way: typically wearing trainers, tracksuit, hoodie, and cap. This dress code is in part a visible investment in identity that rejects the goals and values of mainstream society and signals membership in an alternative culture. It is explicitly identified with resisting education; it is a term that first emerged to categorize different types of teenagers at school (Hollingworth & Williams 2009, 479). A recent survey of school children found that 'Chavs' "always try and disobey rules and everything ... [they are] the ones who are disruptive in class, trying to make everyone's life a misery" (Hollingworth & Williams 2009, 475).[24]

Just as the phenomenon of 'Acting white' was found to be strongest in suburban schools in which the majority of students were not black (Austen-Smith & Fryer 2005), the term 'Chav' did not emerge in inner city areas, where divisions typically occur along ethnic lines, but rather emerged in (predominantly white) suburban areas and in state schools attended by children from a mixed socio-economic background. This is consistent with the emphasis our model places on the transmission of values amongst peers.

4.3   Religious Groups and Resistance to Education

A final application of our theory is to religious groups, particularly strict sects that do not share mainstream values and beliefs. Religious groups are able to collectively organize in order to resist mainstream or secular education if they feel it threatens their cultural identity. We can establish the following proposition.

The examples of the Amish and ultra-Orthodox Jewish groups suggests that when a minority group has very different cultural values to mainstream society they will limit education because of the threat it poses to young and susceptible individuals. The Amish have been

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[23]The term 'Chav' itself is controversial. It is seen as a way of essentializing undesirable working class attributes (see Hollingworth & Williams 2009).

[24]In fact Hollingworth & Williams (2009) found that chavs were defined as the ones who '"mess about" and disrupt classes and essentially do not value education' (Hollingworth & Williams 2009, 475).

particularly successful at resisting education beyond the level of secondary school. As their cultural values are distinct from those of American society, the Amish 'want their children to be educated in Amish schools, taught by Amishmen in accordance with the Amish value system to prepare them for life in the separated Amish society' (Casad 1967, 425-426) because they believe mainstream society to 'be part of the "Satanic Kingdom".

Consistent with our model the Amish opposed high school education because adolescents are seen to be particularly vulnerable to outside influences and because the subjects taught at high school (literature, art, sciences, civics and politics) are seen to be inherently corrosive of Amish values (Dewalt & Troxell 1989, Waite & Crockett 1997).[25] Amish parents feared that their children would acquire secular and foreign values: '[t]he paramount fear lurking beneath all the other concerns was that modern education would lead Amish youth away from farm and faith, and undermine the church. The wisdom of the world, said Amish sages, "makes you restless, wanting to leap and jump, and not knowing where you will land."' (Kraybill 1989, 2001, 131). Unlike other minority groups that have attempted to inoculate themselves against the influence of mainstream values, the Amish are able to successful resist mainstream education because they 'retain economic self-sufficiency, residential independence, and complete control of their own schools' (Dewalt & Troxell 1989, 308).[26]

A parallel example is provided by contemporary ultra-Orthodox or Haredi Jews. Heilman notes that among ultra-Orthodox Jews education is everything: 'the purpose of Jewish existence and at the same time a barrier against its decay' (Heilman 1992, 171). But, as Moshe Krakowski remarks, ultra-Orthodox religious education is very different to secular education in that it involves 'apprenticeship into communal practices' and is not means of acquiring new knowledge (Krakowski 2008, 17). Berman (2000) studies Jewish educational practices and provides an explanation for the increase in religious education amongst ultra-Orthodox Jews based on a club goods model of religion.

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[25]'Adolescence is the time when most parents decrease their control over their children, but also the time before the young person has joined the church. It is important that in this stage of their lives the young people identify with the Old Order community and not with the values of the world so that they establish a commitment to the community' (Dewalt & Troxell 1989, 309).

[26]In the 1960s the conflict between the Amish community and the government came to a head and some Amish parents even went to jail for refusing to send their children to school. This was only resolved in 1972 when the Amish were granted the right to limit formal education to eight grades (*Wisonsin v. Yoder*). Since then, Amish communities have provided their own community-based education through to eighth grade at which age young Amish leave school and begin work as adults.

Our theory can account for why ultra-Orthodox opposition to secular education emerged at that same time that ultra-Orthodox Judaism split away from Reform Judaism and traditional Judaism in the mid-nineteenth century.[27] Prior to the mid-nineteenth century, Jews faced a host of legal and economic restrictions which prevented them from working as lawyers or government officials and restricted their economic freedom. The gradual lifting of these restrictions in the early nineteenth century—a process known as Jewish emancipation—enabled Jews to enter the professions and to participate in the market as equals. This corresponds to an increase in the skill premium as identified in our model (a shift from f to g).

Rising economic returns to education generated a remarkable increase in Jewish participation in higher education; exactly as a standard model of human capital accumulation would predict, Jews 'were seized with a hunger for the new education' (Kober 1947, 211-212). However, this effect was not uniform. Consistent with Proposition 4, while many seized the new educational opportunities, others were threatened by them and sought to insulate themselves from this threat by taking up *less* secular education. In many parts of Eastern Europe, the acceptance or rejection of secular education was one of the factors that caused ultra-Orthodox Judaism to breakaway from traditional Judaism. The new forms of ultra-Orthodoxy in Hungary, in Poland and Galicia, and in Lithuania imposed new restrictions on secular education and learning a foreign language:

> They created a network of schools that embraced life from youth to age and that, wherever possible, evaded the harmful influence of secular education — what was called by insiders "alien wisdom" (*chochmos chitzonios*). In their schools the young were turned into haredim. They were taught to speak and write in a separate Haredi version of a Jewish language that kept outsiders at bay — Yiddish, encrusted with acronyms and insider expressions, even more than modern Hebrew. They were confirmed in their distinctive appearance and dress that made assimilation in the outside world impossible. They were introduced to their customs, folkways, values and versions of the life that made them conscious of their own traditions, which were also presented as the true Judaism. Anything short of that was "putting darkness into light." (Heilman 1992, 171)

These groups not only resisted secular education, they were also opposed to Jewish emanci-

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pation, as Proposition 5 would predict.[28] This resistance to secular education enabled them to successfully preserve their distinctive cultural values. The effects of this episode of cultural polarization continue to this day as ultra-Orthodox schools in North America, the UK, and Israel still maintain strict restrictions on secular education.

5 Concluding Comments

Economic incentives alone cannot easily explain variation in educational outcomes by ethnicity, class and religion. Not all groups have increased their investment in education in response to the rising skill premium in recent decades. In fact, high school graduation rates in the US have remained flat in recent decades. Moreover, policies that were designed to increase educational attainment among disadvantaged minorities have had limited success. In this paper, we develop a model that provides a unified explanation for these patterns of education.

In particular, we study how the cultural transmission of values shapes individual incentives to invest in education. Education transmits cultural traits that undermine minority culture. Thus to preserve their cultural identity, it can be individually rational for members of minority groups to curtail their investment in education. Most surprisingly, an increase in returns to education for high-ability individuals always induces low-ability minority types to *resist education*. Hence an increase in inequality caused by a rising skill premium is amplified by cultural resistance to education. The implication is that an increase in the skill premium may generate less inequality in a culturally homogeneous society than in a multicultural one.

We apply the model to three seemingly disparate case studies and show that there may be common forces at work: (1) the phenomenon of 'acting white' in African American communities; (2) the development of oppositional attitudes to education among the white working class in Britain; (3) the emergence of resistance to education among religious groups such as the Amish and ultra-Orthodox Jews.

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[28]When Napoleon's armies threatened to bring emancipation to the Jews of Russia, Rabbi Shneur Zalman commented that: 'If Bonaparte wins, wealth will increase in Israel and the glory of Israel will be raised, but the heart of Israel will be separated and estranged from their Father in Heaven. But if our Lord Alexander should win, even though poverty will increase in Israel and its glory be lowered, the hearts of Israel will be bound, fastened and tied to their Father in Heaven' (quoted in Goldfarb 2009, 126-27).

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Appendix

Proof of Proposition 1. The proof follows from the argument in the text and by differentiation of (3). $\square$

Proof of Proposition 2. Because $\hat{e} \in (0,1)$ for all $q \in [0,1]$, (4) is positive at $q = 0$ and negative at $q = 1$. (4) is also continuous in q. By the intermediate value theorem then, there exists at least one point $q^* \in (0,1)$ at which $h(q)$ cuts the horizontal axis from above. $\square$

Proof of Proposition 3. By hypothesis $\dot{q} = 0$ at $q_T = q^*$. By inspection of (5), $\hat{e}$ increases with the shift from f to g, because $g(a) > f(a)$ for all $a \in (0, \bar{a})$. As (4) is strictly increasing in $\hat{e}$, this shift lifts $\dot{q}$ above zero, so that q_t increases. The transition to the new steady state is depicted in Figure 3. Since $\dot{q} > 0$ during the transition, $q_t > q^* = q_T$ for all $t > T$.

Let $\hat{e}_t$ be the mean level of education at time t. Note that $\dot{q} = 0$ at time T, so $\frac{1}{2}(1+q_T)\hat{e}_T = q_T$, or:

$$\hat{e}_T = \frac{2q_T}{1 + q_T} \ . \tag{5}$$

By the argument above, we know that $\dot{q} > 0$ for $t > T$. Therefore:

$$\hat{e}_t > \frac{2q_t}{1 + q_t}$$

for $t > T$. Since $q_t > q_T$ for all $t > T$, $\frac{2q_t}{1+q_t} > \frac{2q_T}{1+q_T}$, so that $\hat{e}_t > \hat{e}_T$ for all $t > T$. $\square$

Proof of Proposition 4. By (3), $e^*(a, \theta, q_T, f) > e^*(a, \theta, q_t, g)$ if and only if:

$$\frac{\sigma f(a)}{c - \frac{1}{2}\delta_\theta(1 + q_T)} > \frac{\sigma g(a)}{c - \frac{1}{2}\delta_\theta(1 + q_t)}. \tag{6}$$

Rearranging:

$$\frac{f(a)}{g(a)} > \frac{c - \frac{1}{2}\delta_\theta(1 + q_T)}{c - \frac{1}{2}\delta_\theta(1 + q_t)}. \tag{7}$$

The RHS of (7) evaluated at $\theta = M$ is greater than one, because $\delta_M > 0$ and $q_t > q_T$ for all $t > T$ by Proposition 3. The LHS of (7) is less than one because $g(a) > f(a)$. Hence M types never resist education.

The RHS of (7) evaluated at $\theta = m$ is less than one, because $\delta_m < 0$. Bias implies $\lim_{a \to 0} f(a)/g(a) = 1$. By continuity, there exist a value $\underline{a}_t \in (0, \bar{a})$ such that a type (a, θ) agent resists education at time $t > T$ if $\theta = m$ and $a \in (0, \underline{a}_t]$. $\square$

Proof of Corollary 1. Bias and MLRP together imply that dominance holds, so that Propositions 3-4 go through. By MLRP, the LHS of (7) is strictly decreasing in a. Taken together with the argument above, this implies that there exists some cutoff $\hat{a}_t \in (0, \tilde{a}_t)$ such that (7) holds if and only if $\theta = m$ and $a \in (0, \hat{a}]$. $\square$

Proof Of Proposition 5. Substituting (3) into (1), we can compute:

$$V(a, \theta, q, f) = f(a) \left(\frac{\sigma f(a)}{c - \frac{1}{2}\delta_\theta(1+q)} \right)^{\frac{\sigma}{1-\sigma}} - \left[c - \frac{1}{2}\delta_\theta(1+q) \right] \left(\frac{\sigma f(a)}{c - \frac{1}{2}\delta_\theta(1+q)} \right)^{\frac{1}{1-\sigma}} + \nu_\theta(m)$$

$$= f(a)^{\frac{1}{1-\sigma}} \left(\frac{\sigma}{c - \frac{1}{2}\delta_\theta(1+q)} \right)^{\frac{\sigma}{1-\sigma}} - \sigma f(a)^{\frac{1}{1-\sigma}} \left(\frac{\sigma}{c - \frac{1}{2}\delta_\theta(1+q)} \right)^{\frac{\sigma}{1-\sigma}} + \nu_\theta(m)$$

$$= (1-\sigma) f(a)^{\frac{1}{1-\sigma}} \left(\frac{\sigma}{c - \frac{1}{2}\delta_\theta(1+q)} \right)^{\frac{\sigma}{1-\sigma}} + \nu_\theta(m).$$

$$(8)$$

Hence $V(a, \theta, q_t, g) < V(a, \theta, q_T, f)$ if and only if:

$$(1-\sigma) f(a)^{\frac{1}{1-\sigma}} \left(\frac{\sigma}{c - \frac{1}{2}\delta_\theta(1+q_T)} \right)^{\frac{\sigma}{1-\sigma}} > (1-\sigma) g(a)^{\frac{1}{1-\sigma}} \left(\frac{\sigma}{c - \frac{1}{2}\delta_\theta(1+q_t)} \right)^{\frac{\sigma}{1-\sigma}}$$

$$(9)$$

$$\frac{f(a)}{g(a)} > \left(\frac{c - \frac{1}{2}\delta_\theta(1+q_T)}{c - \frac{1}{2}\delta_\theta(1+q_t)} \right)^{\sigma}.$$

This is the same as condition (7) for resisting education, except that the RHS is raised to the power of σ, where $0 < \sigma < 1$, so that it is lower than the RHS of (7). The result follows immediately. $\square$

Proof of Corollary 2. The result follows immediately from the proof of corollary 1. $\square$