Resisting Education

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Abstract
Educational institutions not only build human capital; they also shape culture. We present a model of cultural dynamics produced by cultural transmission through the education system. Groups that are culturally marginalized become economically disadvantaged and exhibit various forms of resistance to education. First, individuals may *drop out* of education to avoid its cultural content. Second, individuals may invest in other forms of socialization to *tune out* the cultural content of education. Finally, cultural communities may collectively resist mainstream education by *turning out* to change curricula or establish their own schools. We show that resistance to education can make it impossible for a policymaker to eliminate alternative cultural traits from the population. In fact, a policymaker may have to moderate the cultural content of education or else face a backlash which increases the spread of alternative cultural traits. Our analysis unifies a growing body of empirical work on the effects of cultural policies and makes new predictions regarding the effect of socializing institutions on cultural dynamics. (JEL: I2; Z1; D10; D71)

Keywords: Education; cultural transmission; religion; ideology; cultural resistance.

We don't need no education
We don't need no thought control...
Hey teacher, leave them kids alone

Pink Floyd, *Another Brick in the Wall (Part II)*

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1. Introduction

Cultural dynamics are shaped both by top-down interventions by policymakers and the bottom-up choices of individuals. In this paper, we examine the interaction between these forces in the context of education. We add to the cultural transmission framework developed by Bisin and Verdier (2000, 2001, 2017) a socializing institution—the education system—and ask the following questions: To what extent can a policymaker spread a cultural trait through a population using the education system? What is the effect of resistance to education on educational inequality across groups? Which forms of resistance reduce or even reverse the effect of cultural interventions in the education system?

Economists now recognize that modeling education purely as an investment in human capital neglects its social aspects, including its role in shaping cultural beliefs, values, and habits (Akerlof and Kranton, 2002). Numerous empirical studies have documented the various ways individuals and groups can respond to the cultural content of education (see Fouka, 2019; Bazzi, Hilmy and Marx, 2020, among others). We are the first to model the cultural dynamics produced by cultural transmission through the education system in the face of various forms of resistance to education.

Policymakers often attempt to shape society through the cultural content of education (e.g., ideology), by setting curricula or establishing the bounds of acceptable inquiry, and through the behavioral norms observed in schools. Individuals, however, are not passive recipients of cultural information. They have their own preferences over cultural traits and can resist attempts at cultural control. Hence, use of the education system to transmit certain values can backfire. In this paper, we identify the conditions under which this occurs. We also examine the effects of cultural intervention and resistance on educational attainment, parental socialization, and school choice among different groups. In doing so, our analysis unifies a growing body of empirical work by economists and political scientists on the consequences of cultural policies, and provides a new model of socializing institutions and their effect on cultural dynamics.[1]

Our model suggests the following taxonomy for the various forms of resisting education observed in the literature:

(i) *Dropping out* occurs when individuals underinvest in education in order to avoid the cultural traits being transmitted by the education system. By transmitting mainstream cultural values, education poses a cultural threat to individuals with alternative/minority traits. Hence these groups

[1] As we apply our analysis to a range of contemporary and historical examples, it is important to emphasize that we do not take a normative position for or against the mainstream ideas / values that are the object of resistance in our model.

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 effect on culture. That is, they "drop out".

(ii) *Tuning out* occurs when parents or individuals themselves invest in alternative forms of socialization to offset (or "tune out") the cultural content of education. Examples include teaching alternative cultural values at home, religious education outside of school, joining ethnic/religious associations at college, consuming alternative forms of media, and joining online groups formed around alternative ideologies.

(iii) *Turning out* occurs when individuals organize to collectively resist education. Whereas dropping out and tuning out take place predominantly at the individual level, turning out refers to collective action by alternative/minority groups that reduces the spread of mainstream cultural traits, including changes in curricula and creation of their own schools.

We study the effect that each type of resistance has on human capital formation and cultural dynamics.

First, resistance to education means that the cultural content of education has potentially large effects on human capital formation and intergroup inequality. In our model, mainstream and alternative types are identical in terms of economic productivity. However, human capital becomes concentrated among mainstream types, as alternative types drop out of education to protect their cultural values. Thus cultural marginalization produces economic disadvantage.

By distinguishing between different ways of resisting education, our model also generates a variety of predictions concerning cultural dynamics. Dropping out has little impact on the evolution of cultural traits in the population. A policymaker can completely eliminate the alternative trait from the population, no matter how weakly they transmit the mainstream trait through the education system. By contrast, when tuning out is added, it becomes impossible for the policymaker to eliminate the alternative trait. Nevertheless, the policymaker can always design an intervention that raises the population share of the mainstream trait above the level achieved when education is culturally neutral (the no-intervention benchmark). In the presence of tuning out, however, a policymaker can overreach. Under certain conditions, strengthening the transmission of the mainstream trait through the education system can *reduce* the steady state share of the mainstream trait in the population, as alternative types socialize (i.e., tune out) more intensively. Following Fouka (2019), we call this phenomenon "backlash." Finally, collective resistance to education (turning out) can further constrain cultural transmission through the education system via a stronger form of backlash in which increasing the strength of institutional transmission induces alternative types to switch from mainstream to alternative schooling.

Some prominent examples of resistance to education come from the United States. Opposition to the teaching of evolution in schools dates back decades and crystalized in the 1980s with the modern intelligent design movement resulting in legal challenges and, in some cases, state-level legislation (Coleman and Carlin, 1994; Laats, 2020). The homeschooling movement also began in the 1970s. Initially founded by individuals who felt schools were harmful for children's development, the movement took off largely because it was attractive to religious conservatives opposed to the content of modern secular education (Carper, 2000; Stevens, 2001). Today two examples are restrictions on the teaching of critical race theory (CRT), and limitations placed around the discussion of gender identity and sexual orientation in schools.

Resisting education is, however, a far more general phenomenon. Our analysis provides a unified explanation for notable examples of cultural resistance that have been documented by economists and political scientists (e.g., Fouka, 2019; Bazzi et al., 2020). An early example of such an analysis is Carvalho (2013), which treats veiling by Muslim women as a form of cultural resistance and shows how bans on veiling can increase the spread of religious values. We show how our model applies to class-based attitudes to education in the UK, resistance to secular education in Turkey and France, Islamic schooling in Indonesia and sub-Saharan Africa, and isolationist groups such as the Amish. An illustrative case is the emergence in northeastern Nigeria of Boko Haram, a terrorist organization whose name translates to "western education is forbidden". As we discuss in the conclusion, our model can also be readily applied to other socializing institutions, including the media.

2. Historical Background and Literature Review

The idea that education involves the transmission of ideology or cultural values is not new. When compulsory education was first introduced on a large-scale across Europe in the 19th century, its express purpose was to forge a national culture and identity in newly created, secular states (Reisner, 1922; Langsom, 1950; Weber, 1976; Green, 1990; Bandiera, Mohnen, Rasul and Viarengo, 2019; Alesina, Giuliano and Reich, 2021). As demonstrated by Aghion, Jaravel, Persson and Rouzet (2019), it was often motivated by the threat of war (see also Sambanis, Skaperdas and Wohlforth, 2015). Consider the French case documented by Weber (1976). The French system of centralized state education originated in a law passed in 1833 designed to foster social order and "increase the sense of unity under French nationhood" (Weber, 1976, p. 331). Secular education was an instrument of socialization and cultural homogenization: school "had to teach children national and patriotic sentiments, explain what the state did for them and why it exacted taxes and military service and show them their true interest in the fatherland" (Weber, 1976, p. 332). In the 1880s, the Republican government decided that 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 goes on to note 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, pp. 334-336).

This cultural program met with resistance outside the urban centers and the Paris basin, where identities were mainly local rather than national: Breton, Basque, Gascon, or Provencal, rather than French. French was not the first language for either pupils or instructors and they had little sense of the geography or history of France. The teaching of the French language was seen for what it was, an attempt to widely instill a metropolitan French national culture. Weber quotes a teacher in Loire in 1864: "[i]n the villages, anyone who tried to speak French wouldn't escape the jeers of his neighbors ... He would be turned to ridicule" (p. 312). In the southwest of the country, he notes that "Many Pyreneans seem to have stubbornly resisted this 'emancipation' from their local speech" (Weber, 1976, p. 313).

Ultimately, the French program was successful, instilling a national culture and identity even in peripheral regions. The French experience was repeated across the world. As countries developed, many invested in a centralized system of education that promoted a shared national culture or "imagined community" (Anderson, 1983). Kaiser Wilhelm II declared that "it will fall upon the school in its various grades to lay the foundations of a healthy conception of political and social relations, through the cultivation of fear of God and love of country" (quoted in Langsom, 1950). Indeed, Cinnirella and Schueler (2018) provide evidence that the expansion of primary education in Germany increased the vote share of pro-nationalist political parties. Communist governments used the education system and other institutions to undermine religiosity (Barro and McCleary, 2005; McCleary and Barro, 2006). Likewise, contemporary nondemocratic governments invest in public education to shape cultural attitudes and create loyalty to the state (Lott, 1990; Testa, 2018). Saint-Paul (2010) builds a model in which the public education system transmits anti-market values and these beliefs become self-fulfilling by making the economy more sclerotic. Alesina, Giuliano and Reich (2021) show how non-democratic rulers might use education as an homogenizing technology when they face the threat of democratization. Cantoni, Chen, Yang, Yuchtman and Zhang (2017) examine the impact of a new high school curriculum introduced by the Chinese Communist Party between 2004 and 2010. Treated students reported viewing

China as more democratic than they had previously and being more skeptical of unconstrained (Western) democracy and free markets.

Many of the examples we will discuss below are from the US. Like France, the US education system was founded with a cultural mission, being "notoriously geared to turning a heterogeneous immigrant population into an ethnically homogeneous one, with the warm concurrence of the population so processed" (Gellner, 1983, 109).[2] Indeed, Bandiera, Mohnen, Rasul and Viarengo (2019) find evidence that American states introduced compulsory schooling to assimilate recent immigrants during the 'Age of Mass Migration' between 1850 and 1914. However, precisely because public schooling in the United States was established at the state level, it was less centralized than in France. In addition, the success of the high school movement in increasing enrollments in the early 20th century was largely due to individuals voluntarily acquiring education rather than state compulsion (see Goldin and Katz, 2008). The perception that public schools in the United States today are inculcating progressive ideas concerning race and gender has produced several forms of resistance to education, particularly collective resistance through the political system.

There is now a large literature on cultural evolution in economics (e.g., Bisin and Verdier, 2000; Kuran and Sandholm, 2008; Spolaore and Wacziarg, 2013; Giuliano and Nunn, 2021). Recent work introduces socialization by cultural leaders and groups. Hauk and Mueller (2015) study how a leader can tune parameters in the standard Bisin-Verdier model, including the degree of cultural intolerance, to promote a cultural trait. Carvalho (2016) shows how oppositional groups can form to shield those who want to acquire alternative cultural traits from the transmission of mainstream traits by centralized socializing institutions (e.g., state media). Carvalho and Koyama (2016), Carvalho, Koyama and Sacks (2017), Prummer and Siedlarek (2017), and Verdier and Zenou (2018) study interventions by a single leader to shape the cultural transmission process, while Verdier and Zenou (2015, 2018), Chen, McBride and Short (2019), and Carvalho and Sacks (2021) analyze competition among cultural leaders.

Notably, Verdier and Zenou (2018) examine cultural leaders who directly transmit traits in the manner described here. The difference is that they do not consider any of the three forms of cultural resistance that we study. Cohen-Zada (2006) analyzes a model of socialization through public and religious schooling. As in our model, alternative forms of education (e.g., religious schooling) are used to cultivate alternative cultural traits. However, the focus is on static school choice and not on cultural dynamics. Giusta, Hashimzade and Myles (2017) present a different and more specialized model

[2]The American public education system has also been viewed as cultivating values of conscientiousness, time-keeping, and self-discipline that were required for capitalist production (see Bowles and Gintis, 1976; Katz, 1976).

of cultural transmission through the education system without strategic choice of institutional transmission, tuning out, turning out, or backlash.[3]

There is also important work on the positive cultural effects of education including cultural homogenization and intergroup cooperation (Gradstein and Justman, 2002), pro-social values (Dixit, 2009), good work habits (Sáez-Martí and Zenou, 2012), crime reduction (Lochner and Moretti, 2004), civic engagement (Milligan, Moretti and Oreopoulos, 2004; Glaeser, Ponzetto and Shleifer, 2007), higher voter turnout and support for freedom of speech (Dee, 2004), support for democracy (Ticchi et al., 2013), and nation building and economic growth (Gradstein and Justman, 2002; Alesina, Giuliano and Reich, 2021). While cultural homogenization and national identification are viewed positively by mainstream/majority groups, they are often seen as a threat to the culture and identity of alternative/minority groups. G. Akerlof and Kranton (2002) propose that schools 'impart an image of ideal students, in terms of characteristics and behavior' (p. 1169). Students who do not fit this ideal identity may reject the education system. Rates of rejection can be reduced by making the ideal identity more inclusive, possibly by creating multiple ideals. R. Akerlof (2017) shows how individuals who reject academic achievement invest in alternative value systems and sever ties with academically successful peers.[4] Building on this work, we unify the various responses under the umbrella of cultural resistance and show how they can be incorporated into the Bisin-Verdier cultural transmission framework.

3. The Model

Consider a model in which individuals choose whether or not to get educated. Education confers human capital but also transmits the mainstream cultural trait. We are interested in the effect of the cultural content of education on education inequality and cultural dynamics. We begin by considering the first two forms of resisting education, dropping out and tuning out. Turning out is examined in Section 4.

Time is discrete and denoted by $t = 0, 1, 2, \ldots$ At each time t, the adult population is a continuum with unit mass. Individuals have one of two cultural traits, $\theta \in \{a, b\}$. Trait a is the officially sanctioned or 'mainstream' trait and

[3]In a different context, Bisin, Rubin, Seror and Verdier (2024) model the interaction between institutional and cultural dynamics to explain how institutional developments in the Islamic world could have helped to reinforce more conservative cultural trends. See also Iyigun, Rubin and Seror (2021) on conservative revivals.

[4]See also Bénabou and Tirole (2011) on the effect of investments in identity on economic behavior. Other theories of underinvestment in education focus on human capital (Borjas, 1992, 1995; Eguia, 2015) and social interactions (Austen-Smith and Fryer, 2005; Fryer, 2007).

trait b is the alternative trait. The share of the adult population with trait a at time t is denoted by q_t. The initial cultural state q_0 is exogenously given.

At each time $t > 0$, every adult (asexually) produces a child, chooses whether or not to invest in the child's education $e \in \{0, 1\}$, and is replaced by their child. It does not matter whether education is chosen by the parent or the child. For example, investment $e = 1$ can denote college education chosen by the parent or educational effort chosen by the child. Education produces human capital worth H at cost c. We assume the cost of education c is an i.i.d. draw from the c.d.f. F, which is continuously differentiable and strictly increasing on $[0, \overline{c}]$. Hence individuals vary in their (psychic and pecuniary) costs of education. To focus on interior solutions, we assume $F(H - 1) > 0$ and $F(H + 1) < 1$.

Education bundles the production of human capital with cultural content. Both the economic and cultural consequences of education are taken into account by individuals when choosing education. Following Bisin and Verdier (2000, 2001), we assume a type θ parent prefers that their child acquire trait θ, all else equal. Specifically, we assume a type θ parent receives a cultural payoff of $\Delta_\theta \in (0, 1)$ when their child ends up with trait θ and zero otherwise. As is standard, Δ_θ is referred to as the 'cultural intolerance' of θ types, i.e., how much they dislike the other trait. A similar interpretation applies when e is the child's choice of educational effort: Each child is born with their parent's cultural trait θ and incurs a dissonance cost of Δ_θ when switching cultural traits.

We are interested in the degree to which the education system can be used to spread the mainstream trait a through the population. This trait can be thought of as a preferemce, an ideology, or narrative. We begin with the benchmark case in which all schools are under the control of the policymaker and are oriented toward trait a. We allow cultural communities to establish their own schools in Section 4. An economic analysis recognizes that individuals have their own objectives and agency, so cultural transmission here is not a simple statistical process. Instead, the attempt at cultural control by the policymaker can be resisted in various ways. To understand the constraints a policymaker faces in shaping culture, we explore three forms of resisting education: (i) dropping out, (ii) tuning out, and (iii) turning out.

For uneducated ($e_i = 0$) children, cultural transmission occurs according to the Bisin and Verdier (2000, 2001) formulation: Let τ parental socialization effort (or self-socialization effort). With probability τ, the child acquires their parent's trait. This is called *vertical transmission*. If vertical transmission fails, with probability $1 - \tau$, the child acquires a cultural trait through *oblique transmission*. That is, the child is exposed to a member of the adult population drawn uniformly at random and acquires their trait. Thus, through oblique transmission, a child at time t acquires trait a with probability q_t and trait b with probability $1 - q_t$.

For educated ($e_i = 1$) children, our contribution is to add to the cultural transmission process a socializing institution—the education system.[5] Once again vertical transmission succeeds with probability τ. Now if vertical transmission fails, the educated child can acquire a cultural trait through *institutional transmission*. Institutional transmission succeeds with probability s, in which case the child acquires the mainstream trait a. For example, s could be the fraction of the curriculum devoted to cultural content. We refer to $s \in (0, 1]$ as the strength of institutional transmission. With probability $1 - s$, institutional transmission fails and oblique transmission occurs as above. From Section 3.2 onward, s will be dynamically tuned by a policymaker.

This process of cultural transmission is depicted by Figure 1. For an educated individual, institutional transmission is added to the vertical and oblique transmission processes that form the standard Bisin-Verdier formulation.

Denote the likelihood that a type θ child with education e and socialization effort τ ends up with trait θ by $P_\theta(e, \tau)$. Dropping time notation for the moment, we can write:

$$\begin{aligned} P_a(1,\tau) &= \tau + (1-\tau)[s + (1-s)q] \\ P_a(0,\tau) &= \tau + (1-\tau)q \\ P_b(1,\tau) &= \tau + (1-\tau)(1-s)(1-q) \\ P_b(0,\tau) &= \tau + (1-\tau)(1-q). \end{aligned}$$

Recall that the (realized) cost of education is c. We assume the cost of socialization effort τ is $(1/2)\tau^2$. Hence the payoff to an a type with socialization effort τ depends on education as follows:

$$e = 1 \quad : \quad H + P_a(1,\tau)\Delta_a - \tfrac{1}{2}\tau^2 - c \tag{1}$$

$$e = 0 \quad : \quad P_a(0,\tau)\Delta_a - \tfrac{1}{2}\tau^2. \tag{2}$$

The payoff to a b type with socialization effort τ is:

$$e = 1 \quad : \quad H + P_b(1,\tau)\Delta_b - \tfrac{1}{2}\tau^2 - c \tag{3}$$

$$e = 0 \quad : \quad P_b(0,\tau)\Delta_b - \tfrac{1}{2}\tau^2. \tag{4}$$

We can now analyze socialization and education choices and the cultural dynamics they produce at the population level.

3.1. Dropping Out and Tuning Out

The types of resistance examined here are dropping out and tuning out. Both could be the product either of the actions of parents or of

[5] As discussed in the conclusion, our modeling approach can also be applied to other socializing agents, including the media.

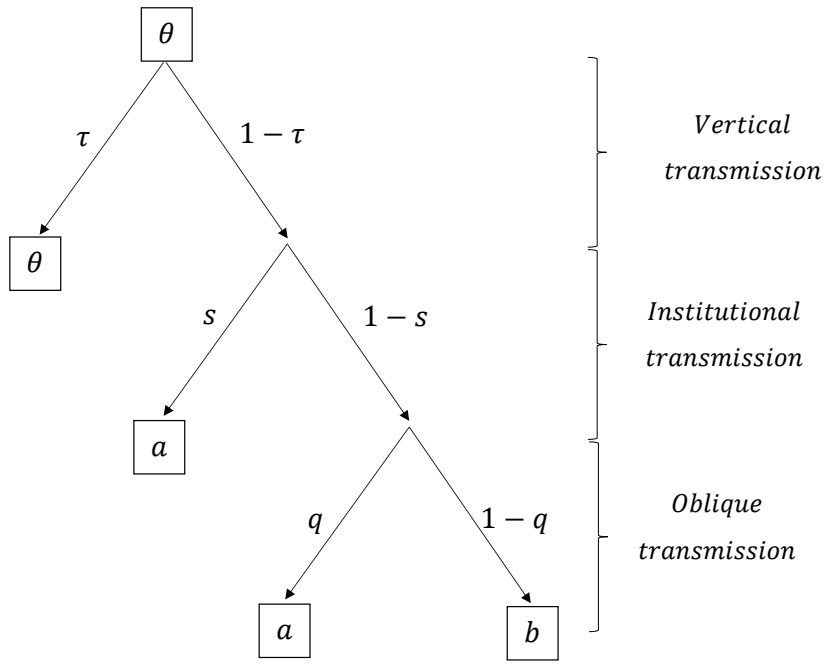

FIGURE 1. Cultural transmission probabilities for an educated individual ($e = 1$) born to a θ-type parent, where τ is parental (or self) socialization effort, s is the strength of institutional transmission, and q is the share of a types in the adult population. Cultural transmission probabilities for an uneducated individual ($e = 0$) are the same, except with $s = 0$.

children, depending on who makes the education choice. With regard to tuning out, parents can shield children from the cultural effects of education through teaching cultural values at home, attending religious services, or exposing children to alternative role models. Children can also self-socialize by consuming alternative cultural messages via social media, joining clubs for religious and ethnic minorities at college, and so forth. We capture all of these ways of neutralizing the cultural content of education through the choice of socialization effort τ and refer to such behaviors collectively as 'tuning out'. Clearly, 'dropping out' refers to the education choice $e = 0$.

Socialization Effort. Let $\tau_{\theta e}$ be the optimal socialization effort for a θ type parent who chooses education e. Maximizing (1) and (2) with respect to τ yields the optimal socialization efforts for a types:

$$\tau_{a1} = [1 - q - s(1 - q)]\,\Delta_a \quad (5)$$

$$\tau_{a0} = (1 - q)\Delta_a. \quad (6)$$

Maximizing (3) and (4) with respect to τ yields the optimal socialization efforts for b types:

$$\tau_{b1} = [q + s(1-q)]\,\Delta_b \quad (7)$$
$$\tau_{b0} = q\Delta_b. \quad (8)$$

For $s > 0$ and $q < 1$, educated a types socialize less intensively because institutional transmission is a substitute for their socialization effort. The opposite occurs for educated b types who attempt to tune out the cultural content of education.

Cultural Transmission. Using the optimal socialization effort for each type, we can derive the equilibrium transmission probabilities. Since the education system transmits the a trait, one may think that individuals who choose education are more likely to acquire the a trait. That is not necessarily true, however. Rather, *parental (and self) socialization can overwhelm institutional transmission.*

For alternative b types, education increases the likelihood that they acquire trait a if $P_b(1,\tau_{b1}) < P_b(0,\tau_{b0})$. From (7)-(8),

$$\begin{aligned} P_b(1,\tau_{b1}) - P_b(0,\tau_{b0}) &= \tau_{b1} + (1-\tau_{b1})(1-s)(1-q) - [\tau_{b0} + (1-\tau_{b0})(1-q)] \\ &= -s(1-q)\left[1 - s\Delta_b - (2-s)q\Delta_b\right]. \end{aligned} \quad (9)$$

Hence education increases the likelihood that a b type ends up with the a trait if and only if

$$s < \frac{1-2q\Delta_b}{(1-q)\Delta_b} \equiv \overline{s}. \quad (10)$$

Note that $\overline{s} < 1$ whenever $\Delta_b > (1+q)^{-1}$. Therefore, if alternative types are sufficiently intolerant, the policymaker might not wish to push the mainstream a trait too hard through education system. Otherwise, alternative b types will overcompensate for the cultural effect of education through parental or self socialization.

For a types, education increases the likelihood that they acquire trait a if $P_a(1,\tau_{a1}) > P_a(0,\tau_{a0})$. From (5)-(6),

$$\begin{aligned} P_a(1,\tau_{a1}) - P_a(0,\tau_{a0}) &= \tau_{a1} + (1-\tau_{a1})[s + (1-s)q] - [\tau_{a0} + (1-\tau_{a0})q] \\ &= s(1-q)\left[1 - (2-s)(1-q)\Delta_a\right]. \end{aligned} \quad (11)$$

Hence education increases the likelihood that an a type ends up with the a trait if and only if

$$s > \frac{2(1-q)\Delta_a - 1}{(1-q)\Delta_a} \equiv \underline{s}. \quad (12)$$

Note that $\underline{s} < 1$. Hence for education to increase transmission of the a trait among a types, institutional transmission of the a trait must be sufficiently

strong. The reason is that educated a types exert less socialization effort than uneducated a types, because part of their socialization comes from the education system. If s is low, this reduction in socialization effort overwhelms the strength of institutional transmission and reduces the likelihood that an educated a type acquires the a trait relative to an uneducated a type.

Education Choice. An a type chooses $e = 1$ if $c \leq c_a$, where the cutoff is

$$c_a = H + s(1-q)\left[1 - \tfrac{1}{2}(2-s)(1-q)\Delta_a\right]\Delta_a. \tag{13}$$

Similarly, a b type chooses $e = 1$ if $c \leq c_b$, where the cutoff is

$$c_b = H - s(1-q)\left[1 - \tfrac{1}{2}s\Delta_b - \tfrac{1}{2}(2-s)q\Delta_b\right]\Delta_b. \tag{14}$$

For derivations, see the Appendix.

Education imposes a cultural cost on alternative b types that induces them to underinvest in education relative to the benchmark case in which education has no cultural effect and relative to mainstream a types. Dropping out of the education system is a form of cultural resistance aimed at shielding b types from institutional transmission of the mainstream a trait. Absent the cultural effects of education, the share of both a and b types who choose $e = 1$ would be $F(H)$. Hence the extent of dropping out by b types is

$$D_b \equiv F(H) - F(c_b), \tag{15}$$

which is positive for $s > 0$ and $q < 1$.

It is a different story for a types who embrace education. They favor the cultural content of education and "drop in" to the following extent

$$D_a \equiv F(c_a) - F(H) = F\left(H + s(1-q)\Delta_a\right) - F(H). \tag{16}$$

As illustrated by the case studies to follow, dropping out can explain part of the variation in educational outcomes by ethnicity, class, and religion. Hence attempts to culturally transform society through the education system can have important economic effects on human capital formation and structural inequality.

Educational Representation. The mix of cultural traits among the educated subpopulation is given by

$$q_{e=1} \equiv \frac{qF\left(c_a\right)}{qF\left(c_a\right) + (1-q)F\left(c_b\right)}. \tag{17}$$

Because $F(c_a) > F(c_b)$,

$$q_{e=1} \;>\; q. \tag{18}$$

That is, the cultural mix of the educated subpopulation is tilted toward mainstream a types, so cultural marginalization brings economic disadvantage. The cultural content of education thus has profound economic effects, shifting

the distribution of human capital (and presumably economic and political power) toward mainstream a types. This means that such a policy might be pursued by a policymaker who has no cultural interest, only an objective to maximize the economic and political power of one cultural group. Note that without tuning out the educated subpopulation would be even more skewed toward mainstream types, because parental socialization dampens the cultural effects of education.

Cultural Dynamics. The cultural dynamic is

$$\begin{aligned} q_{t+1} &= q_t \left[F(c_a)P_a(1,\tau_{a1}) + (1-F(c_a))P_a(0,\tau_{a0})\right] \\ &\quad + (1-q_t)\left[F(c_b)\left(1-P_b(1,\tau_{b1})\right) + \left(1-F(c_b)\right)\left(1-P_b(0,\tau_{b0})\right)\right] \end{aligned} \tag{19}$$

For convenience, we will work with the continuous-time limit of this dynamic, described at the beginning of the Appendix. Substituting for the transmission probabilities, subtracting q_t from both sides, and taking the continuous-time limit:

$$\begin{aligned} \dot{q} &= q(1-q)\left[(1-q)\Delta_a - q\Delta_b\right] \\ &\quad + sq(1-q)F(c_a)\left[1-(2-s)(1-q)\Delta_a\right] \\ &\quad + s(1-q)^2F(c_b)\left[1-s\Delta_b-(2-s)q\Delta_b\right]. \end{aligned} \tag{20}$$

We proceed for the moment by analyzing the dynamic with an exogenous strength of institutional transmission s. The classic Bisin-Verdier result can be recovered by setting $s = 0$. In this case, the dynamic converges from any interior state $q_0 \in (0,1)$ to

$$q^* = \frac{\Delta_a}{\Delta_a + \Delta_b}.$$

The greater the relative intolerance of a types, the greater their steady-state population share.

With institutional transmission $s > 0$, there is no general closed-form solution for the long-run cultural distribution. In addition, without further restrictions on the distribution F, we cannot rule out the possibility of multiple interior steady states. Nevertheless, we can say a significant amount about the equilibrium structure.

Denote the right-hand side of (19) as $G(q)$. A steady state of the cultural dynamic (20) is a fixed point of G. $G : [0,1] \to [0,1]$ is a continuous function, so a fixed point exists by Brouwer's fixed point theorem. Because (20) is a differential equation in one dimension, it converges to one of these fixed points.

Note that $G(0) = sF\left(H - s(1-(1/2)s\Delta_b)\Delta_b\right)\left[1-s\Delta_b\right] > 0$. By inspection $G(1) = 1$. In addition, $\lim_{q\to 1} G'(q) = 1 + \Delta_b + sF(H) > 1$. Hence $G(q) < q$ for q close to 1. As G is continuous, these facts imply that there exists at least one interior fixed point of G by the intermediate value theorem.

In addition, the fact that $G(0) > 0$ and $G(q) < q$ for q close to 1 implies that $G(q)$ cuts the 45° line from above at the smallest and largest interior steady

states. Hence these states, denoted by $\underline{q}$ and $\overline{q}$ respectively, are asymptotically stable. Finally, the fact that $G(1) = 1$ and $G(q) < q$ for q close to 1 implies that $q = 1$ is an unstable steady state.

These results are summarized in the following proposition:

PROPOSITION 1. *For exogenous $s > 0$, the following behavior is exhibited:*

(i) From any initial $q_0 \in [0, 1)$, the dynamic converges to an interior state $(0 < q < 1)$.
(ii) There exists a steady state at $q = 1$, which is not Lyapunov stable.
(iii) The smallest and largest interior steady states, $\underline{q}$ and $\overline{q}$, are asymptotically stable.

According to Proposition 1, the policymaker cannot fully eliminate trait b from the population by pushing the mainstream a trait through the education system. From every state except $q_0 = 1$, a polymorphic distribution of cultural traits arises. Note that dropping out alone cannot prevent the alternative trait from dying out; it only slows down the process. It is tuning out that preserves cultural diversity in the face of institutional transmission. In the Bisin-Verdier model, the smaller the cultural minority, the more intensively it socializes, which keeps the minority culture from dying out. In this model, the stronger the cultural intervention by the policymaker, the more intensive is socialization (tuning out) by the alternative cultural group. This cultural resistance is strong enough to prevent the alternative cultural trait from dying out.

3.2. Endogenous s: The Policymaker's Problem

We shall now make s the subject of choice by a policymaker who sets $s_t \in [0, 1]$ in each period to maximize the spread of the mainstream trait. In particular, we assume the policymaker chooses s_t period-by-period to solve the following problem:

$$\max_{s_t \in [0,1]} \; q_t(s_t, q_{t-1}), \tag{21}$$

subject to the dynamic (19).

Hence, when tuning the strength of institutional transmission, the policymaker cares about the share of mainstream types along the entire transition path. In the continuous-time limit, this is equivalent to choosing s in each state q to maximize $\dot{q}(s, q)$. Note that the dynamic $\dot{q}(s, q)$ given by (20) is continuous in s and $s \in [0, 1]$. Hence, by Weierstrass' theorem, there exists a maximizer $s^*(q)$ in each state q. We denote by $q_t(s^*)$ the solution to this differential equation when s is dynamically tuned by the policymaker according to (21). As before, when the policymaker chooses a fixed s for all time, we denote the solution by $q_t(s)$.

How is effective is such a policymaker at spreading the mainstream trait through the education system?

Proposition 2. *When the strength of institutional transmission is endogenous:*

(i) The maximizer $s^*(q) > 0$ in all states $q \in [0, 1)$.
(ii) From any initial state $q_0 \in [0, 1)$, the dynamic converges to an interior state.
(iii) Beginning in any initial state $q_0 \in [0, 1)$, the share of mainstream types at each time t is larger than when education is culturally neutral: $q_t(s^*) > q_t(0)$ for all $t > 0$.

The proof of this all and other propositions is in the Appendix.

First, the policymaker chooses a positive strength of institutional transmission whenever the alternative trait is present.[6] Numerical analysis indicates that $s^*(q)$ is increasing in the share of mainstream types q, and strictly so for $s^*(q) < 1$. Second, even when dynamically tuning the strength of institutional transmission, the policymaker cannot eliminate the alternative trait. Once again, this occurs due to tuning out. The difference is that some additional technical arguments are required when s is endogenous. Third, even though the policymaker cannot completely eliminate the alternative trait, cultural interventions are not entirely ineffective. By an appropriate choice of $s(q)$, the policymaker can achieve a larger population share of trait a in each period than without institutional transmission. Hence, from every initial state $q_0 \in [0, 1)$, $\lim_{t\to\infty} q_t(s^*) > q^* = \Delta_a/(\Delta_a + \Delta_b)$.

The results of Proposition 2 are robust to a broad range of specifications for institutional transmission. For example, the effectiveness of institutional transmission could depend on the composition of the population q. Denote by $x(s, q)$ the probability that a child with education $e = 1$ acquires the mainstream trait when vertical transmission fails. In our model, this function takes the form $x(s, q) = s + (1 - s)q$. Now consider a more general form $z(s, q)$ requiring only that $z(0, q) = q$ and the image of $z(\cdot, q)$ is $[q, 1]$. Any probability in $[q, 1]$ can be generated by an appropriate choice of s in both specifications. Therefore, switching to the more general specification amounts to a change of variable. Hence, Proposition 2 continues to hold. The reason is that, when agents consider education, they only care about its direct benefit and the probability of adopting a particular trait, but not whether the adoption occurs through institutional or oblique transmission. Among other things, that means the results are robust to the introduction of complementarities between s and q.[7]

[6] Recall that $q = 1$ is a steady state regardless of the policymaker's choice of strictness. Hence $s^*(1)$ can be any feasible value.

[7] A remaining possibility is that the dynamics are qualitatively different if institutional transmission reduces (resp., raises) the cost of direct socialization of trait a (resp., b). *Inter alia*, this would lead to a substitution of dropping out for tuning out, with the net effect being unclear.

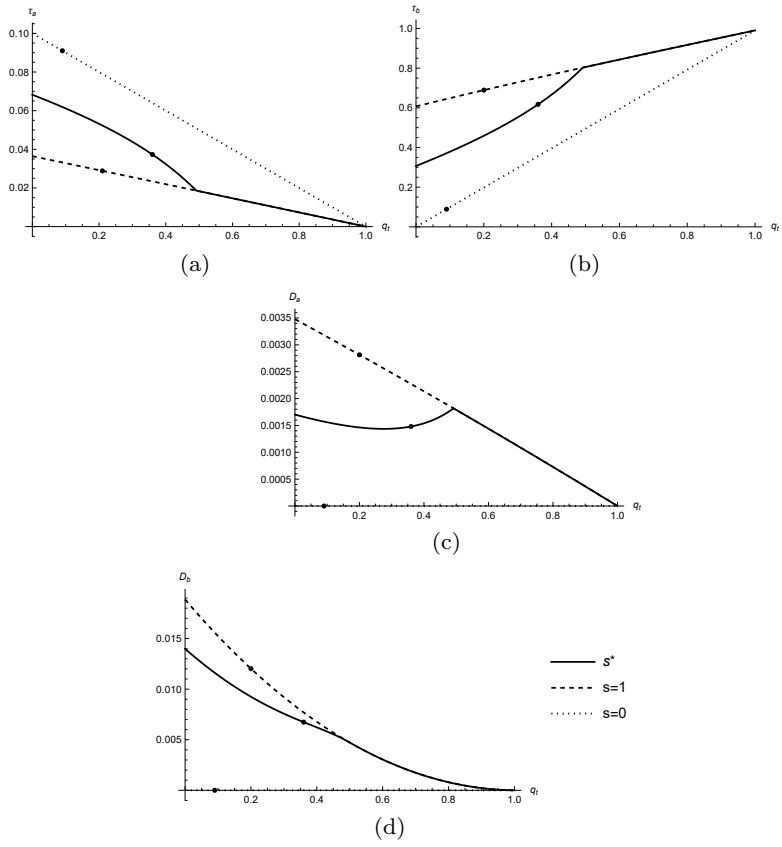

FIGURE 2. (a) Tuning out by a types, (b) Tuning out by b types, (c) Dropping in by a types, and (d) Dropping out by b types for different specifications of s. The dots denote the unique interior steady state for each specification of s. *Parameter values*: $F = \text{Exp}(1/10)$, $\Delta_a = 0.1$, $\Delta_b = 0.99$, and $H = 10$.

We can now examine the dynamics of cultural resistance. Suppose the policymaker is trying to boost q starting from a low initial share of a types. Dropping out by b types is decreasing in q, because when q is large uneducated individuals are likely to acquire the mainstream trait anyway through oblique transmission. In contrast, we know from (7) that tuning out by b types is increasing in q, because tuning out protects against the greater likelihood of acquiring the mainstream trait via oblique transmission. Hence, along the transition path to the interior steady state q^*, dropping out becomes less important and tuning out takes over as the main form of resistance to education by b types. This is illustrated by Figure 2 which plots tuning out and dropping in/out for both mainstream and alternative types for values $s = 0$, $s = 1$, and the dynamically tuned s^*.

Overall, we have learned that the policymaker can increase the spread of the mainstream trait through the education system. However, that does not mean that the steady state share of mainstream types is monotonically increasing in the strength of institutional transmission s. As we shall now see, the policymaker can push it too far, resulting in a form of "backlash".

3.2.1. Backlash Backlash occurs when increasing the strength of institutional transmission s beyond some threshold reduces the share of the mainstream trait a in the population. Hence backlash does not simply constitute resistance to the cultural content of education. It also requires this resistance to overwhelm the direct effect of strengthening institutional transmission. Naturally, a sophisticated policymaker will set $s < 1$ to avoid a backlash.

PROPOSITION 3. *There exists a neighborhood of* $(0,1)$ *such that, if* (Δ_a, Δ_b) *lies in this neighborhood, then the following applies:*

(i) There exists a threshold share of mainstream types $\hat{q} \in (0, 1/2)$ *such that the policymaker sets* $s^*(q) < 1$ *to avoid a backlash if and only if* $q_t < \hat{q}$*, i.e., if the share of alternative types is large enough.*

(ii) If $F(H)^2 < F(H - 1/2)$*, then for all initial states* $q_0 \in [0, 1)$*, there exists a finite time* t_0 *(possibly zero) such that the policymaker sets* $s_t^* < 1$ *to avoid a backlash for all* $t \geq t_0$*.*

That is, when mainstream types are highly tolerant and alternative types are highly intolerant, the policymaker cannot push the mainstream trait too hard through the education system without a backlash. In particular, alternative types produce a backlash to strong institutional transmission $s^* = 1$ of the mainstream trait if and only if their population share is large enough. Even if the share of alternative types is small to begin with, so that $s_t^* = 1$ initially, it eventually grows large enough to generate a backlash when Δ_b is large, Δ_a is small, and $F(H)^2 < F(H - 1/2)$. The latter condition means that the economic return to education H is not too large.

To illustrate, let us examine a few examples.

EXAMPLE 1. $c \sim U(0, m)$. The condition $F(H)^2 < F(H - 1/2)$ becomes $(H/m)^2 < (H - 1/2)/m$, which is verified to always hold when $H + 1 < m$.[8] ■

EXAMPLE 2. $c \sim \text{Exp}(\lambda)$. The condition $F(H)^2 < F(H - 1/2)$ simplifies to

$$e^{-\lambda H} < 2 - e^{\lambda/2}. \tag{22}$$

[8]To show this, $H^2 < (H - 1/2)m$ iff $(H - 1/2)H + (1/2)H < (H - 1/2)m$ and thus $(1/2)H < (H - 1/2)(m - H)$. As $m - H > 1$, the right side exceeds $H - 1/2$, which is larger than $(1/2)H$ iff $H > 1$.

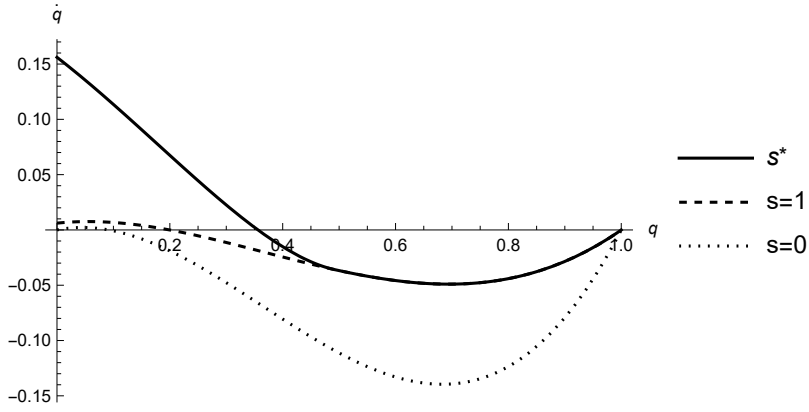

FIGURE 3. The cultural dynamic under various strengths of institutional transmission s, given $F = \text{Exp}(1/10)$, $\Delta_a = 0.1$, $\Delta_b = 0.99$, and $H = 10$. The interior steady state in each case is approximately $q = 0.09$ when $s = 0$, $q = 0.2$ when $s = 1$, and $q = 0.36$ at the optimal s^*.

For $\lambda \geq 2\log 2$, this inequality is violated for all values of $H > 1$. For $0 < \lambda < 2\log 2$, the inequality holds whenever $H > -\lambda^{-1}\log\left(2 - e^{\lambda/2}\right)$, which is a large segment of the domain. For $0 < \lambda < -2\left(\log(2) - \log\left(\sqrt{5}+1\right)\right)$, the inequality always holds. ■

Figure 3 provides a numerical illustration of backlash. Suppose education costs are exponentially distributed ($F = \text{Exp}(1/10)$), b types are highly intolerant ($\Delta_b = 0.99$), and a types are less intolerant ($\Delta_a = 0.1$). The dotted curve is the cultural dynamic with $s(q) = 0$ for all $q \in [0,1]$, i.e., the baseline Bisin-Verdier cultural dynamic. Let us focus on the unique stable steady state. We know the steady-state share of the population that acquires the mainstream a trait is $q^* = \Delta_a/(\Delta_a + \Delta_b)$, which in this example is approximately 9%.[9] Now suppose the strength of institutional transmission is increased fully to $s(q) = 1$ for all $q \in [0,1]$. The resulting dynamic is depicted by the dashed curve. The steady-state share of a types rises to 20%. Hence the policymaker can significantly boost the share of mainstream types by using the education system for cultural transmission. However, the policymaker can do even better by optimally tuning s^* over time, with $s_t^* \in (0,1)$. The resulting dynamic is depicted by the solid curve. The steady-state strength of institutional transmission is approximately 0.64 and the unique interior steady state is approximately 36%. Therefore, the policymaker can significantly increase the share of mainstream types by *weakening* institutional transmission of the mainstream trait. In other words, when alternative b types are sufficiently

[9]By mainstream trait, we do not necessarily mean that the trait is held by the majority, since a trait could be promoted through the education system by a small elite.

intolerant, strengthening the transmission of the mainstream trait generates a backlash, with dropping out and tuning out overwhelming the larger direct effect of education on cultural transmission. In contrast, when b types are less intolerant (e.g., $\Delta_b = 0.5$), numerical results indicate that the interior steady state is monotonically increasing in s and backlash does not occur. One possible implication is that extreme assimilationist policies will not work on groups that are culturally distant and strongly attached to their culture/identity.

What is the mechanism behind backlash? Backlash is based primarily on tuning out by alternative b types, which shows up in the likelihood that an educated child of a b-type parent acquires trait b, $P_b(1, \tau_{b1})$. Strengthening institutional transmission s has two countervailing effects: (i) the *direct effect* and (ii) the *resistance effect*. The *direct effect* is the effect of increasing the likelihood of acquiring the mainstream trait through institutional transmission, which lowers $P_b(1, \tau_{b1})$. The *resistance effect* is the response to institutional transmission becoming more threatening to alternative values, which raises $P_b(1, \tau_{b1})$.

It turns out that the resistance effect can dominate. While payoffs to b types are strictly decreasing in s (by the envelope theorem), numerical examples in Figure 4 illustrate that the likelihood of an educated b-type child acquiring the alternative trait, $P_b(1, \tau_{b1})$, can be increasing in s over at least part of the domain, particularly for large s. The reason lies in the structure of cultural transmission depicted by Figure 1, which is based on the canonical model of Bisin and Verdier (2000, 2001) and mirrors the stages of an individual's life, with parents having the first go at socialization, followed by schools, followed by the broader society. This is a multiplicative structure that entails strategic complementarities between s and τ_{b1}. To illustrate, we write:

$$\begin{aligned} P_b(1, \tau_{b1}) &= (1-q)\cdot(1-s) + [q + s\cdot(1-q)]\tau_{b1} \\ &= \underbrace{(1-q)\cdot(1-s)}_{\text{Direct Effect of } s} + \underbrace{[q+(1-q)\cdot s]^2 \cdot \Delta_b}_{\text{Resistance Effect of } s}. \end{aligned} \tag{23}$$

One can see from the resistance effect in the first line that s and τ_{b1} are strategic complements. As $\tau_{b1} = [q + s(1-q)]\Delta_b$, the resistance effect is quadratic in s. The reason is that raising s increases the marginal benefit to tuning out by educated b types, as well as the degree of tuning out itself, τ_{b1}. The multplicative structure creates a multiplier, meaning that the resistance effect increases at a superlinear rate in s. In contrast, the direct effect is linear in s (i.e., no multiplier). Hence, for s large the resistance effect can overwhelm the direct effect. A necessary condition for this to occur is that Δ_b must also be sufficiently large, i.e., alternative types must be sufficiently intolerant. Thus, by trying to neutralize the cultural content of education, highly intolerant parents can overcompensate in protecting their children from mainstream culture.

Finally, given that backlash does not occur on the equilibrium path in our model, why might we observe backlash to cultural policies in practice? In our model, there are no intertemporal tradeoffs; the policymaker maximizes

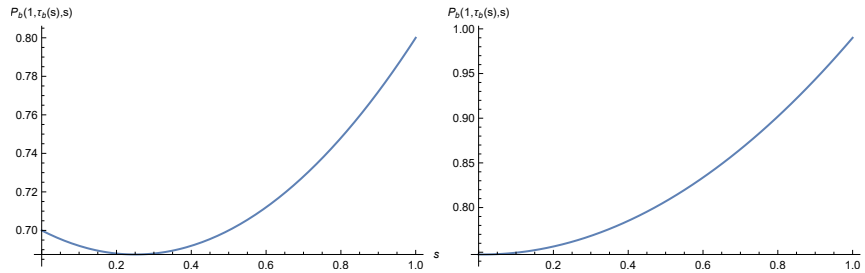

FIGURE 4. The likelihood that an educated child of a b-type parent acquires trait b as a function of the strength of institutional transmission s, given (a) $\Delta_b = 0.8$ and (b) $\Delta_b = 0.99$. Other parameter values: $F = \text{Exp}(1/10)$, $\Delta_a = 0.1$, $q = 1/2$, and $H = 10$.

the share of mainstream types in each period. Hence myopia or impatience cannot produce backlash. Instead, the model points to two reasons why a policymaker may fail to avoid backlash. First, the policymaker may not have full knowledge of the system, and in particular the conditions under which strengthening institutional transmission of the mainstream trait promotes the spread of the alternative trait. It is not inconceivable that a policymaker discounts such a possibility altogether and overreaches. Indeed, that is one of the main contributions of this paper, to show how backlash can surprisingly occur as an outcome of resistance to education. Second, the policymaker may not be a unified agent and hence not a full dynamic optimizer. Cultural policies are often set through political lobbying and compromise among a number of competing political interests. We discuss some examples of this in our case studies in Section 5. Overly ambitious cultural policies may be concessions to radical and intransigent factions, as part of a larger bargaining problem. Extreme policies may also be pushed through during "windows of opportunity" or to build coalitions around a cultural program, where milder policies would not get through. Hence, backlash may be something that a policymaker or group of decision makers is willing to tolerate over the status quo. Even in this case, it is useful to describe the conditions under which backlash occurs and the extent thereof.

4. Collective Resistance: Turning Out

Up to this point, we have only considered resisting education at the individual level. In addition to dropping out and tuning out, b types could 'turn out' as a community to collectively resist mainstream education. For example, b types could establish their own schools. Alternatively, the local curriculum content in b-type regions could be altered to transmit the alternative b trait. These forms of collective resistance can be captured by a simple change to the

baseline model. For now, we abstract from political economy considerations that determine whether or not a particular community has the ability to establish its own schools. We return to political economy considerations in Section 5.3.

Let the education choice set now be $\{0, 1a, 1b\}$, where $1a$ is mainstream education and $1b$ is alternative b type education. For example, $1a$ could be state-provided schooling and $1b$ could be private religious schooling. Alternatively, $1a$ could be a choice of school district with mainstream public schooling and $1b$ a school district with alternative public schooling (e.g., a ban on teaching evolution). If no education $e = 0$ is chosen, the payoffs are the same as for an uneducated individual in Section 2. If education $e = 1a$ is chosen, the individual acquires human capital worth H_a at cost c. The strength of institutional transmission of trait a is $s_a \in (0, 1]$. If education $e = 1b$ is chosen, the individual acquires human capital worth H_b at higher cost $c + \kappa$. The strength of institutional transmission of trait b is $s_b \in (0, 1]$. We will describe how s_a and s_b are determined shortly. We assume $H_a \geq H_b - \kappa \geq 0$, so that mainstream education has a larger net economic benefit than alternative education. This could reflect, for example, the higher cost of private education or the lower quality of strict religious schooling.

The likelihood that a type θ child with education e and socialization effort τ ends up with trait θ, $P_\theta(e, \tau)$, is given by

$$\begin{aligned}
P_a(1a, \tau) &= \tau + (1-\tau)[s_a + (1-s_a)q] \\
P_a(1b, \tau) &= \tau + (1-\tau)(1-s_b)q \\
P_a(0, \tau) &= \tau + (1-\tau)q \\
P_b(1a, \tau) &= \tau + (1-\tau)(1-s_a)(1-q) \\
P_b(1b, \tau) &= \tau + (1-\tau)[s_b + (1-s_b)(1-q)] \\
P_b(0, \tau) &= \tau + (1-\tau)(1-q).
\end{aligned}$$

The payoffs to an a type with socialization effort τ are:

$$e = 1a \quad : \quad H_a + P_a(1_a, \tau)\Delta_a - \tfrac{1}{2}\tau^2 - c \tag{24}$$

$$e = 1b \quad : \quad H_b + P_a(1_b, \tau)\Delta_a - \tfrac{1}{2}\tau^2 - c - \kappa \tag{25}$$

$$e = 0 \quad : \quad P_a(0, \tau)\Delta_a - \tfrac{1}{2}\tau^2. \tag{26}$$

The payoffs to a b type with socialization effort τ are:

$$e = 1a \quad : \quad H_a + P_b(1_a, \tau)\Delta_b - \tfrac{1}{2}\tau^2 - c \tag{27}$$

$$e = 1b \quad : \quad H_b + P_b(1_b, \tau)\Delta_b - \tfrac{1}{2}\tau^2 - c - \kappa \tag{28}$$

$$e = 0 \quad : \quad P_b(0, \tau)\Delta_b - \tfrac{1}{2}\tau^2. \tag{29}$$

As $H_a \geq H_b - \kappa$ and $P_a(1_a, \tau) > P_a(1_b, \tau)$, a types will never choose alternative education $e = 1b$. Hence, with appropriate relabeling, the socialization efforts for a types are as before given by (5)-(6) and education choice is given by the cutoff (13).

However, b types might choose alternative education $e = 1b$ if the cultural benefit outweighs the economic cost. Maximizing (27)-(29) with respect to τ yields the optimal socialization efforts for b types:

$$\tau_{b1a} = [q + s_a(1-q)]\,\Delta_b \tag{30}$$
$$\tau_{b1b} = q(1-s_b)\Delta_b \tag{31}$$
$$\tau_{b0} = q\Delta_b. \tag{32}$$

Substituting (30) into (27), the payoff to b types from mainstream education is

$$H_a - c + \left[(1-s_a)(1-q) + \tfrac{1}{2}\left(q + s_a(1-q)\right)^2 \Delta_b\right]\Delta_b. \tag{33}$$

Substituting (31) into (28), the payoff to b types from alternative education is

$$H_b - c - \kappa + \left[1 - q(1-s_b) + \tfrac{1}{2}q^2(1-s_b)^2\Delta_b\right]\Delta_b. \tag{34}$$

Denote the economic benefit of mainstream education by $E \equiv H_a - H_b - \kappa > 0$. Subtracting (33) from (34), b types prefer alternative to mainstream education when the economic benefit from mainstream education is sufficiently low:

$$E < s_b q[1 - q\Delta_b + \tfrac{1}{2}s_b q\Delta_b]\Delta_b + s_a(1-q)[1 - q\Delta_b - \tfrac{1}{2}s_a(1-q)\Delta_b]\Delta_b \tag{35}$$
$$\equiv \overline{E}(s_a, s_b, q, \Delta_b). \tag{36}$$

While the left-hand side of (35) is the economic benefit of mainstream education, the left-hand side is the cultural cost to b types of mainstream education. By observation, this cultural cost $\overline{E}(s_a, s_b, q, \Delta_b)$ is positive. Note that this threshold is strictly increasing in the strength of institutional transmission in both mainstream schools (s_a) and alternative schools (s_b). That is, the incentive for b types to switch to alternative schooling is greater when mainstream schooling is more of a cultural threat (s_a is high) and when alternative schools are more effective at transmitting the alternative cultural trait (s_b is high).

If $E \leq \overline{E}(s_a, s_b, q, \Delta_b)$, so that b types prefer alternative education to mainstream education, then b types would also choose $e = 1b$ over no education $e = 0$ if and only if

$$c \leq H - \kappa + s_b q\left[1 - \tfrac{1}{2}(2-s_b)q\Delta_b\right]\Delta_b \equiv \hat{c}_b. \tag{37}$$

Note that $\hat{c}_b > c_b$ when mainstream types prefer alternative education to mainstream education, i.e., $E < \overline{E}(s_a, s_b, q, \Delta_b)$. The reason is that c_b is the threshold below which b types prefer mainstream education to no education (see (A.7)). When $E < \overline{E}(s_a, s_b, q, \Delta_b)$, alternative education yields a higher

payoff than mainstream education, hence the threshold $\hat{c}_b$ is larger. Intuitively, the rate of education for b types goes up because education now produces a cultural as well as economic benefit for them.

Educational Representation. The mix of cultural traits among the educated subpopulation, when turning out occurs is given by

$$\hat{q}_{e=1} \equiv \frac{qF(c_a)}{qF(c_a) + (1-q)F(\hat{c}_b)}. \tag{38}$$

When b types prefer alternative education, we know $c_b < \hat{c}_b$. Hence, in this case, the overrepresentation of a types in education declines further as alternative education raises the rate of education among alternative b types. In fact, b types may no longer be underrepresented. In particular, if $s_b > s_a$ and the additional cost of alternative education κ is sufficiently low, then $\hat{c}_b > c_a$. This would make $\hat{q}_{e=1}$ less than q, which is the population share of a types.

Of course, if b types choose mainstream education, then educational representation is as before with dropping out and tuning out only, with b types underrepresented.

Cultural Dynamic. Consider the case in which turning out occurs: $E \leq \overline{E}(s_a, s_b, q, \Delta_b)$. The cultural dynamic in this case is

$$\begin{aligned} q_{t+1} &= q_t \left[F(c_a)P_a(1,\tau_{a1a}) + (1-F(c_a))P_a(0,\tau_{a0})\right] \\ &\quad + (1-q_t)\left[F(\hat{c}_b)\left(1-P_b(1,\tau_{b1b})\right) + (1-F(\hat{c}_b))\left(1-P_b(0,\tau_{b0})\right)\right] \end{aligned} \tag{39}$$

Substituting for the transmission probabilities, subtracting q_t from both sides, and taking the continuous-time limit, we have

$$\begin{aligned} \dot{q} &= q(1-q)\left[(1-q)\Delta_a - q\Delta_b\right] \\ &\quad + s_a q(1-q)F(c_a)\left[1-(2-s_a)(1-q)\Delta_a\right] \\ &\quad - s_b q(1-q)F(\hat{c}_b)\left[1-(2-s_b)q\Delta_b\right]. \end{aligned} \tag{40}$$

Again, we can recover the standard Bisin-Verdier dynamic by setting $(s_a, s_b) = (0,0)$.

Hence, the overall cultural dynamic with turning out is[10]

$$\dot{q} = \begin{cases} (20) & \text{if } E \geq \overline{E}(s_a, s_b, q, \Delta_b) \\ (40) & \text{if } E < \overline{E}(s_a, s_b, q, \Delta_b). \end{cases} \tag{41}$$

Now let us examine the equilibrium dynamics given the strength of institutional transmission in the mainstream education system, s_a, and the strength of institutional transmission in the alternative education system, s_b.

As before, we assume the mainstream policymaker sets s_{at} period-by-period to maximize the spread of the mainstream trait:

$$\max_{s_{at} \in [0,1]} q_t(s_{at}, s_{bt}, q_{t-1}), \tag{42}$$

[10] When applying (20) in this section, replace s with s_a and q with q.

subject to the dynamic (41).

To simplify the analysis, we assume $s_{bt} = 1$ for all t. That is, the cultural content of alternative education is dominated by the alternative trait, which is plausible. As a mild technical condition to ensure that the continuous-time limit of the dynamic is well-defined, we also require that the optimal policy is exclusive in cases where the only inclusive policy available to the policymaker is $s_a = 0$. This is satisfied, for example, when Δ_a is small or Δ_b is large.

The equilibrium dynamics have the following properties.

PROPOSITION 4. *For every initial state $q_0 \in (0,1)$, the population share of mainstream types is (weakly) lower in the dynamic* (41) *with collective resistance than the dynamic* (20) *without collective resistance for all $t > 0$. The reduction is strict for a subset of parameters with positive measure.*

Hence collective resistance further limits the mainstream policymaker's ability to spread the mainstream trait through the education system. Once again, the alternative trait cannot be eliminated no matter how hard the mainstream policymaker tries. In fact, the policymaker may be further inhibited in its efforts due to a stronger form of backlash in which alternative types leave the mainstream education system.

As such, there are conditions under which the mainstream policymaker has to weaken the strength of institutional transmission beyond the level without collective resistance.

PROPOSITION 5. *For a subset of parameters with positive measure, collective resistance leads the a-type policymaker to reduce the strength of institutional transmission.*

This occurs when (i) the mainstream policymaker wants to keep alternative types in the mainstream education system in order to socialize them and (ii) alternative types would exit if the same strength of institutional transmission were chosen as in the case without collective resistance. In this case, the mainstream policymaker has to go further in weakening the strength of institutional transmission in order to maximize the spread of the mainstream trait.

While Propositions 4 and 5 are intuitive, it will be apparent from the proofs that they are not mathematically trivial.

5. Case Studies of Resisting Education

In this section we put our model "to work". We show that it provides a *unified explanation* for policy-relevant puzzles from a range of literatures including education policy, sociology, economic history, and political economy.

We draw on our theoretical framework to consider why in various places and times different forms of cultural resistance to education have been observed. Finally, we discuss broader political economy considerations at the end of the section.

5.1. Dropping Out and Tuning Out

The cultural content of education can trigger various forms of resistance to education. We begin with case studies that illustrate our first two forms of resistance, dropping out and tuning out, and how they can affect educational attainment and inequality.

5.1.1. Class and Education in Britain Our first case study examines the following puzzle in British education. In recent decades, while the returns to education have risen significantly, educational attainment has not responded evenly as some groups have invested more in education than others. The group that is least likely to go on to post-16 education are white British students from poor socio-economic backgrounds. Using data drawn from between 1979 and 2005, Dustmann and Theodoropoulos (2010) find that ethnic minority immigrants and British born ethnic minorities have higher levels of education compared to white natives despite facing lower returns to education. Wealth or credit constraints are unlikely to be the main reason for this as this pattern holds among children eligible for free school meals, a widely used proxy for social disadvantage. Table 1 reports that among these students 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.[11]

Underachievement at age 16 replicates itself in higher education. Recent research provides striking evidence for long standing concerns that working class individuals are underrepresented in higher education (Willis, 1977; Blackburn and Jarman, 1993). A report by the Sutton Trust found that students of white UK heritage were the ethnicity least likely to continue to higher education (Sammons et al., 2015, 3). This was driven by white males from disadvantaged backgrounds.[12] Among males from socially and economically disadvantaged backgrounds, only 27% entered the three or more

[11]Education scholars in the UK use eligibility of free school meals as a proxy for social disadvantage (see Chowdry et al., 2013). 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. By 2019-2020, the percentage of white student obtaining 5 or more A–C grades had fallen to 23.2%.

[12]British students usually study for their A-Levels between the age of 16-18. Hence it is equivalent to high school in the US.

A-Levels usually required to study at university (Sammons et al., 2015, 18). At elite British universities such as Oxford and Cambridge, white working class students remain severely underrepresented. In contrast, students from the lowest socio-economic quintile are mostly likely to attend lower status post-1992 universities if they attend higher education at all.

We propose that these patterns can be explained by the cultural content of education and its effects. Rich qualitative evidence collected by sociologists indicates that higher education is perceived by working class whites as transmitting hostile cultural values. This reflects historical experience. During the nineteenth century independent schools emerged to cater to the demand for human capital among the middle class, while compulsory primary education was perceived by members of the working class as an attempt to discipline and subdue them (McCoy, 1998). Education in the UK is, as a consequence, closely associated with the inculcation of middle class values (e.g., Power et al., 2003), and seen as hostile to traditional working class culture (Willis, 1977). In the words of a prominent sociologist, the education "system itself is one which valorizes middle–rather than working-class cultural capital" (Reay, 2001, 334). In the language of our model, the education system transmitted a package of cultural values, beliefs, and habits that was at odds with working class identity. Because they do not have the same historical experience of class structure, the cultural content of education in the UK is less threatening to members of other minority groups (e.g., Chinese and African immigrants).

In our model, dropping out occurs when an individual's identity is threatened by the cultural content transmitted by the education system. This is precisely the mechanism highlighted by scholars of education who report working-class individuals in elite universities describing themselves as "strangers in paradise" or "fish out of water" (Reay et al., 2009, 1104). Middle class parents have an additional incentive to encourage children, even those who are less academically able, to enter higher education in order to instill these values. Working class parents, in contrast, face a trade-off. They can encourage their children to acquire education which brings material rewards, but comes at the cost of greater cultural distance between parents and child. Thus, there is greater dropping out among the working class, a phenomenon which reproduces the class structure.

Tuning out is also part of the British educational experience. Both parents and students can be responsible for this. A seminal study of working class students studying in (selective) grammar schools in the 1960s conducted by Jackson and Marsden (1966) provides an example of "tuning out" where 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 and Marsden, 1966, 118). In other cases, students themselves invested in values that were at odds with educational attainment by positing "Higher Education as unrealistic and undesirable" and "as not fitting with their own investments

in . . . desirable identities" (Archer et al., 2007, 231). For example, Archer et al. (2003) quote a student who describes 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." (Archer et al., 2003, 177)

This statement highlights the cultural threat posed by education. Education is associated with a distinctly middle-class culture which working-class student can find alienating.

5.1.2. German Americans in the Early Twentieth Century Our second case study analyzes a historical example of failed assimilation policies. This provides an example of *tuning out*. A recent literature in political economy has examined the ability of states to assimilate minorities (Alesina et al., 2021). In some cases these policies have achieved the intended outcome; in other instances they have failed. Fouka (2019) studies the effects of the prohibition of German as the language of instruction in public schools during World War 1 on German ethnic identity. Between 1917 and 1923, 21 states prohibited the use of a foreign language as a language of instruction in public schools. These laws were designed to reinforce national identity and targeted German speakers who were the largest non-English speaking minority in the United States at the time. Exploiting variation between treated cohorts and untreated cohorts who were too old to be at school when the laws were introduced, as well as variation across states, Fouka finds evidence of backlash: ethnic Germans took steps to strengthen their German identity. Rates of endogamy and distinctively German names rose among ethnic Germans. Focusing on the borders of Indiana and Ohio with Michigan and Kentucky, treated cohorts were 10-12 percent less likely to volunteer in Word War 2 prior to the introduction of conscription.

This illustrates how attempts to shape culture and identity through the education system can induce cultural resistance. Viewed through the lens of our theory, German Americans in the 1920s and 1930s were "tuning out" the message of the mainstream education system. They deliberately invested more heavily in their German identity, precisely to offset the "Anglo" content of the English language public education system. In this case, this investment in "tuning out" was sufficient to induce a backlash: the attempt to use the education system to assimilate German Americans (increasing s in our model) was counterproductive, at least according to the metrics examined by Fouka (2019).

While our first case study simply demonstrated the possibility of cultural resistance to education, the example of German-Americans in the early 20th century also sheds light on the *dynamics* of resistance to education in response to an exogenous shock. Prior to World War 1, there was no evidence of cultural resistance. This is likely due to two factors. First, Fouka (2019) notes that

German-Americans were seen as a model minority who on many dimensions had successfully assimilated to American life. Second, the decentralized nature of the American political and educational system meant that the cultural content of the education German-American children received was "moderate". This changed after 1917 with the effect of generating a backlash among at least some German-American families.

5.1.3. Secular Education & Muslims in France Next, we use our framework to study how in France, the emphasis on secular education, and in particular, the prohibition on headscarfs in schools, has intensified the tension between education and traditional values for Muslims.

The French emphasis on a Republican and secular identity in schools has long been a source of tension, first, for religious Catholics (see Squicciarini, 2020), and more recently, for Muslims (e.g., Limage, 2000; Keaton, 2005; Werbner, 2007; Adida et al., 2016). Religion in France is separated from all public affairs, confined by the concept of läcité to the private sphere. Control over schooling was taken away from the Catholic Church in the 1880s (Franck and Johnson, 2016). The implementation of mass compulsory education in 1882 "deprived the Catholic Church of its public role in moral socialization and established the school as the privileged site for inculcating in citizens-to-be a secular morality based on the republican qua universal values of reason, freedom, and equality" (Fernando, 2014, 111). French teachers are civil servants; education is centralized and the model is universal rather than multicultural (Limage, 2000).

The secular character of public education poses a dilemma for devout French Muslims. On the one hand, Muslims are concentrated among the lower socio-economic strata and education offers the most reliable route to higher incomes. On the other hand, the extent to which education emphasizes secular Republican values makes this potential channel out of poverty costly because secular education can undermine Muslim identity. Schools propagate a secular Republican identity that is perceived to be starkly at odds with Islam.[13] Moreover, the "state continues to fund private religious schools—most of them Catholic—that teach the national curriculum. Only two state-funded Muslim schools exist in France" (Fernando, 2014, 81). It is this threat to their religious beliefs and identity that helps to explain underinvestment in education by French Muslims (i.e., dropping out).

Viewed through the lens of our model, recent developments, including the 2004 ban on headscarfs in schools, represent a strengthening of the secular content of mainstream education—that is, an increase in s. As predicted by our model, these policies have intensified tensions. Abdelgadir and Fouka

[13]For example, 'The core of the matter was that many of the French-born, French-educated Muslim youths experienced a falling out with the vocal secularists who opposed the Islamic veils in schools in the name of secularism' (Maillard, 2005, 75).

(2020) find that the headscarf ban reduced the educational attainment of Muslim women, in line with the hypothesis of Carvalho (2013, Proposition 7). Specifically, affected women were less likely to complete secondary education, being more likely to drop out at age 17. They also took longer to complete their education. Lower educational attainment translated into lower labor force participation and employment rates. Following the headscarf ban, Muslim women identified more strongly with their religion. This provides another empirical example of a pro-assimilation policy backfiring because of cultural resistance.

5.1.4. Secular Education and Religion in Turkey Our fourth case study builds on the examples of failed ethnic assimilation considered above. In the case of German-Americans, the nationalist cultural content of the mainstream education system following America's entry into World War 1 turned away German Americans who strongly identified with their ethnicity. In contrast, an example from Turkey suggests that weakening the secular cultural content of education in line with Figure 3 can both improve educational outcomes among religious families and have the unintended consequence of increasing the spread of the mainstream trait.

In the 1990s, an intensely secular education system (established by Ataturk in the 1920s) was reformed to allow for more religious influence. This corresponds to a weakening of the cultural (secular) content of education, s, in our model. Meyersson (2014) applies a regression-discontinuity design to the municipal elections of 1994. Where Islamic mayors were elected, rates of female high school education increased, especially among the poor and religious. Islamic mayors helped finance the provision of Islamic 'add-ons' to the public education system, such as Quaranic study groups and dorms in which girls were able to wear headscarves. Conservative parents became more likely to send their daughters to school. This implies that prior to the election of Islamic mayors, girls from conservative families were "dropping out". In fact, Turkey's female-to-male high school enrollment ratio was only just over 0.5 prior to the reforms, lower than Saudi Arabia, Morocco, Tunisia, and Syria (based on data from the World Bank 2021).[14]

This example also speaks to the possibility of collectively resisting education that we discuss in more detail below, as religiously conservative voters were eventually able to organize. It also illustrates the complex and difficult to anticipate cultural dynamics at work as the treated students ended up becoming *more* secular. They were less likely to be married in adolescence and express Islamic political preferences. The conclusion is that the secular education system not only put girls from conservative families at an economic

[14]By 2018, after the reforms, Turkey's female-to-male high school enrollment ratio was 0.9.

disadvantage, as conservative families resisted education of their daughters, but it also reduced the spread of secular beliefs.

5.2. Turning Out

Now we turn to case studies of collective resistance to education starting with the most prominent examples from the United States.

5.2.1. Education and Contemporary "Culture Wars" in the United States Conflict over the content of curricula in US schools is long-standing. The values of minority religious groups have often come into tension with the version of an American civic religion transmitted by public schools (see the Amish case below). In recent years, however, tensions between the values promoted by the education system and those of a substantial proportion of parents appear to have escalated. This escalation has occurred in the context of a wider series of "culture wars" since the 1990s and a growing polarization of political opinion in the country at large (see Boxell, Gentzkow and Shapiro, 2024). In our model, an increase in the cultural content of education (higher s) and greater polarization (higher Δ_b) can produce various forms of resistance to education, including turning out. Particular tensions have arisen over two issues: race and gender.

With respect to the former, the killing of George Floyd in May 2020 exacerbated racial tensions and reinvigorated longstanding controversies over police brutality, African Americans incarnation rates, and the prevalence of systemic racism. At the same time, violent crime increased, particularly in urban areas. In this newly charged atmosphere, the content of education has come under renewed political scrutiny. This has focused on a specific and much contested topic — the influence of Critical Race Theory (CRT) on how race is taught, particularly in public schools. With respect to gender issues, the teaching of LGBT+ issues in sex education has been a source of contention for many years for religious and conservative parents. From 2015 onward, the topics of gender identity and gender dysphoria have come to the fore, with mainstream educational institutions promoting gender identity choice.

Several examples of turning out in response to these issues standout. Virginian parents opposed to the cultural content of curricula in public schools are credited with the election of the Republican Governor Glenn Youngkin, in a previously Democrat-leaning state.[15] Across the United States, politicians have responded to the concerns of parents with laws restricting the teaching of topics such as CRT. As of April 2023, 18 states have enacted bans. A further nine have

[15]This example also suggests one reason why policies which generate a "backlash" are still chosen by policymakers, since those pushing for more radical content in public schools are often not the same individuals who pay the price at the ballot box.

legislation or policies restricting CRT in progress.[16] Several states including Florida also restrict the teaching of transgender issues in public schools. Parents have also sued public schools for encouraging their children to undergo (social) gender transitions.[17] In the first six months of 2022-2023, approximately 200 books were removed in US public schools for depictions of LGBT+ themes, largely due to parental pressure.[18]. These examples suggest that the extent to which individuals are able to organize politically in response to the cultural content of education is a critical determinant of the form of collective resistance to education that we observe, a theme we discuss in Section 5.3 below.

5.2.2. Muslim Education in Sub-Saharan Africa Our second example of collective resistance to education comes from sub-Saharan Africa, where Muslims have fewer years of schooling on average and are less literate than Christians (Izama, 2014; Platas, 2018; Alesina, Hohmann, Michalopoulos and Papaioannou, 2023). This disadvantage is not explained by disparities in wealth, income, access to schooling, location or other predictors of educational attainment. Having rejected conventional explanations for Muslim underperformance, Platas (2018) focuses on a cultural explanation that closely matches our model.

Platas (2018) suggests that Muslims drop out of mainstream education because of its perceived cultural content. Christian missions founded the first schools in many parts of sub-Saharan Africa and were typically the main providers of education during the colonial period. Thus, Muslims associate education with the promotion of Christianity and secular values. Rather than individually investing in countering the Christian and secular cultural content of the school system, Muslims have organized collectively to establish alternative faith schools that teach materialconsistent with their religious beliefs and identity. In northern Nigeria, for example, parents send their children to Quaranic schools even though state education is freely provided (Csapo, 1981).[19] Indeed, as we predict, Platas (2018) find lower levels of Muslim underinvestment in education where Muslims establish their own faith schools.

[16]See https://worldpopulationreview.com/state-rankings/critical-race-theory-ban-states.

[17]See https://www.edweek.org/leadership/pronouns-for-trans-nonbinary-students-the-states-with-laws-that-restrict-them-in-schools/2023/06https://www.edweek.org/leadership/pronouns-for-trans-nonbinary-students-the-states-with-laws-that-restrict-them-in-schools/2023/06.

[18]See https://pen.org/report/banned-in-the-usa-state-laws-supercharge-book-suppression-in-schools/

[19]There is particular hostility to girls attending state schools: 'General public opinion associates an educated woman with low morals: the higher the education, the lower the morals' as parents believe that 'Western education would open the girls' minds to the evils and vices of modern civilisation' (Csapo, 1981, 313).

Violent forms of collective resistance to education are also possible. One example, also from sub-Saharan Africa, is Boko Haram. Unlike the other examples considered here, Boko Haram is a terrorist group responsible for numerous bombings, murders, and terrorist attacks in Nigeria since 2009. They were not originally violent, however. Their name, Boko Haram, means "(western) education is prohibited". Specifically, Boko Haram represents a strand of conservative Islam that was opposed to education and western influence in Nigeria. Walker (2012, 7) notes that Boko Haram is "against those in northern Nigeria known as 'yan boko.' Yan boko is literally translated as 'child of the book.' It refers to the elite created by the policy of indirect rule used by the British to colonize Nigeria—the people who have had their heads turned away from Allah by easy money and corrupting Western values. To be yan boko is to be spiritually and morally corrupt, lacking in religious piety, and guilty of criminally enriching oneself rather than dedicating oneself to the Muslim umma (community)."

5.2.3. Secular & Islamic Education in Indonesia An important example of collective resistance to education in Indonesia is studied by Bazzi, Hilmy and Marx (2020). The 1970s saw a mass expansion of education. The express motivation for this policy was nation building and secularization following the breakdown of the regime's temporary alliance with political Islam. This policy, known as Sekolah Dasar Presidential Instruction (INPRES), saw the construction of tens of thousands of elementary schools, often in highly religious Muslim areas.[20] Indeed, Bazzi et al. (2020) find that INPRES schools were disproportionately assigned to districts with more Islamic schools in 1972.

Bazzi et al. (2020) show that the expansion of mainstream secular education elicited a coordinated, supply-side response from religious Muslims. Regions where secular schools were established also saw the opening of religious schools, particularly secondary schools. In the language of our model, this is an example of collective resistance by alternative b-types or "turning out". Bazzi et al. (2020) find that the newly created Islamic schools had a more religious curriculum and were successful in instilling Islamic values. The effects were long lasting. Exposure to INPRES is associated with *greater* attachment to Islam, Arabic literacy, and religious piety across a range of Islamic practices, years after the introduction of the policy. As these preferences have been transmitted both vertically and horizontally, Islamic political parties today have better electoral outcomes in areas treated by the policy. Hence collective resistance to the expansion of state education produced backlash in the form of an Islamic revival in Indonesia.

[20]Bazzi et al. (2020, 7) note that "SD INPRES aimed at secularizing and homogenizing primary education. Civic education was to supplant certain Islamic subjects, while instruction was to take place in the national language, Bahasa Indonesia, rather than the local ethnic languages or Arabic."

5.2.4. The Amish Finally, one of the most notable examples of successful collective resistance to education is the Amish. The Old Order Amish live by a set of rules known as the *Ordnung*, which varies from community to community, but everywhere involves strict dress codes for men and women, a ban on full length mirrors, and limitations on the use of modern technology including a prohibition on driving motor vehicles. Because the Amish lifestyle is so drastically at odds with modernity, members who acquire modern tastes and values are at high risk of leaving the community. The preservation of the distinctive Amish way of life thus depends on insulating themselves from mainstream culture.

Unlike other minority groups that have attempted to inoculate themselves against the influence of mainstream values, the Old Order Mennonites or Amish have successfully resisted mainstream education because they "retain economic self-sufficiency, residential independence, and complete control of their own schools" (Dewalt and Troxell, 1989, 308).

The history of the Amish and the public education system is revealing. The Amish did not alway oppose public schools. So long as the public school system remained local and decentralized and schools remained small, they continued to send their children to them because they could influence the content of the curriculum (Hostetler, 1972).[21]

But as the age of compulsory schooling was increased and school districts were consolidated, the Amish began to pull their children out of school. In particular, they opposed sending their children to high school.[22] They saw adolescents as particularly vulnerable to outside influences. The subjects taught at high school (literature, art, sciences, civics, and politics) were also seen to be inherently corrosive of Amish values (Dewalt and Troxell, 1989; Waite and Crockett, 1997).[23] In Amish schools the core curriculum contains reading, spelling, geography, arithmetic, German, and penmanship (Dewalt and Troxell, 1989, 315). German plays a vital role in enforcing and enhancing cultural distance; religious texts and religious services are written and conducted exclusively in German. Science teaching thus conforms to the

[21] The Amish were "not opposed to education," rather they were "extremely concerned about properly educating their children". What they did not want "their children to be subjected to the integrating influences of the public schools or to be taught the values of the larger society, which they consider to be part of the 'Satanic Kingdom."' (Casad, 1967, 425-426).

[22] Specifically, "[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).

[23] "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 and Troxell, 1989, 309).

TABLE 1. Summary of Case Studies

Location	Time	Study	Alternative	Mainstream	Dropping Out	Tuning Out	Turning Out
Britain	21st c.		Working Class	Middle Class	✓	✓	
USA	Early 20th c	Fouka (2019)	German-Americans	Anglo-Americans	✓	✓	
Turkey	20th	Meyersson (2014)	Muslim	Secular	✓		
France	21st	Abdelgadir and Fouka (2020)	Muslim	Secular	✓		
Sub-Saharan Africa	21st	Platas (2018)	Muslim	Christian	✓	✓	✓
USA	20th	Choy (2020)	Amish	Secular	✓		✓
Indonesia	21st	Bazzi et al. (2020)	Muslim	Secular			✓
USA	21st		Conservative	Progressive			✓

Amish communities literal interpretation of the bible and is shorn of any content that might lead students to question this interpretation (Waite and Crockett, 1997).

In the 1960s, the conflict between the Amish community and the government came to a head and some Amish parents were jailed for refusing to send their children to school. It was only resolved when, in 1972, 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 Amish youth leave school and begin work as adults. The long-run survival of the Amish is consistent with Proposition 4. This qualitative evidence suggests that by turning out and establishing their own community-based education system, the Amish have reduced the spread of secular values in their community.[24]

5.3. The Political Economy of Resistance to Education

Table 1 summarizes the case studies we have reviewed in this paper. Our model provides the first unified theory of these phenomena.

So far, however, we have largely abstracted from broader political economy considerations. Specifically, we have not considered why and under what conditions minorities would be granted the right to establish their own schools,

[24]Consistent with our reasoning here, Choy (2020) develops an overlapping generations model which explains Amish educational practices and the shunning of children who leave the community. He notes that stricter (lower affiliation) parents are "more likely to send their children to private Amish schools instead of secular public schools", but the less strict communities have to "devote more effort to teaching and enforcing Amish values in areas other than choice of school type" (Choy, 2020, 734).

a critical determinant of what form cultural resistance will take. The French tradition of secularism had distinctive historical roots that distinguish it from the tradition of Madisonian liberalism in the United States.[25] In some settings, minorities are persecuted and marginalized; in other settings they have been beneficiaries of positive discrimination and affirmative action (see, for example Belmonte and Di Lillo, 2021, who study affirmation action for German-speakers in Tirol). The interaction of these political economy considerations and patterns of cultural assimilation and resistance is left mainly for future research, though we will make a few remarks here.

There are, of course, examples where policymakers have been successful in promoting preferred cultural traits. Clots-Figueras and Masella (2013), for example, study the introduction of a bilingual (Catalan as well as Spanish) system of education in Catalonia. They find that this policy successfully increased the number of people who identify as Catalan and who support Catalan independence. In addition, Bandiera et al. (2018) find that the compulsory schooling laws introduced in the United States in 19th century inculcated shared civic values among first and second generation migrants, specifically among migrants from places such as Ireland and Southern and Eastern Europe, which lacked compulsory schooling.

Nevertheless, examples of policymakers successfully eliminating a minority trait entirely (short of genocide) are extremely difficult to find. This is for reasons explicated by our model. Political authorities, particularly illiberal ones, can restrict turning out, as we have seen, but it is harder to limit tuning out or dropping out. Thus even "successful" instances of nation building such as the efforts of the French state in the late 19th century considered by Weber (1976) did not *eliminate* minority identities such as Breton. More repressive attempts at nation building tend also not to be able to eliminate minority traits. Both the late 19th century Russian Empire and the Soviet Union attempted to repress Ukrainian national identity and were unsuccessful (see Kuzio, 2016).[26] Such policies tend to be costly and to have increasing marginal costs, particularly in diverse societies (see Johnson and Koyama, 2013). Our model shows that raising the return to education is not enough to eliminate the alternative trait, since that just limits dropping out, whereas the alternative trait can be preserved by tuning out alone. To eliminate the alternative trait, there needs to be strong incentives for adopting the mainstream trait, not just for getting educated.

[25]For details on the French case see Squicciarini (2020). For details on the Madisonian tradition in the United States see Feldman (2005) and the discussion in Johnson and Koyama (2019, 275-278).

[26]Similarly, the Japanese attempt to wipe out Christianity in the 17th century was widely believed to have been successful. However, when Japan opened up to the West in the late 19th century, it became apparent that sects of "hidden Christians" had survived (see Johnson and Koyama, 2019, 270-271).

We can also use our theory to analyze which type of cultural resistance we might expect to observe. In Section 3.2, we showed analytically that dropping out becomes less important as the population share of the mainstream trait increases, with tuning out taking over as the dominant mode of resistance to education. There are also important political economy factors that determine whether turning out occurs instead. While dropping out and tuning out are common responses by minority groups to mainstream education, they are particularly prevalent when the minority group is not organized or politically represented. For example, working class whites in Britain do not form a single tightly knit subculture, unlike religious minorities such as ultra-Orthodox Jews or the Amish. They also lack political representation as the British Labour party has become representative of middle class, educated workers and the British education system is highly centralized.[27] Therefore, we observe dropping out and not turning out. This is likely to have also been the case in Turkey prior to the rise of organized Islamic parties studied by Meyersson (2014), as well as in France where the commitment to *laïcité* limits the ability of Muslims to organize religious schools. In contrast, as the analysis of Bazzi et al. (2020) suggests, Muslims in Indonesia were able to coordinate their response to establish religious schools. Similarly, in the United States, high levels of decentralization and democratic participation have enabled conservative and religious groups to push back politically when it comes to the teaching of controversial topics in American schools.

6. Conclusion

Influential work in economics has emphasized the importance of culture and identity to economic decision making (Bisin and Verdier, 2000, 2001; Akerlof and Kranton, 2000, 2010). Recognizing that education not only builds human capital but also transmits cultural values, this paper studies the interaction between economic and cultural incentives for education. We analyze a policymaker who wishes to spread a mainstream cultural trait through the population using the education system, and study cultural resistance to such an intervention. Introducing a taxonomy of resistance to education, we unify a growing literature on the cultural forces shaping education choice. We also characterize the cultural dynamics arising from the interplay between top-down cultural interventions in the education system and bottom-up resistance.

First, individuals whose values deviate from the mainstream can reduce their investment in education in order to preserve their cultural identity. We call this dropping out, and discuss various examples including the white working

[27] Centralization is viewed as a major reason for why creationism never become an organized movement in the UK in contrast to the US (see Locke, 1994).

class in Britain, Germans in the US following World War 1, and Muslims in Turkey and France. Though alternative types can limit their exposure to the mainstream cultural trait by reducing education, dropping out does not prevent the policymaker from completely eliminating the alternative cultural trait from the population. Second, individuals can be shielded from the cultural effects of education by investing in alternative forms of socialization (e.g., religious education). We called this tuning out and showed that it plays an important role in preserving cultural diversity. Despite tuning out, the policymaker can increase the spread of the mainstream trait beyond the no-intervention benchmark, but it cannot eliminate the alternative trait completely. Moreover, the policymaker may have to moderate the cultural content of education to avoid a backlash that causes the alternative trait to spread. Finally, we examined collective resistance to education by allowing alternative types to form their own schools or otherwise shape the cultural content of education. This further reduces the spread of the mainstream cultural trait and can generate a stronger form of backlash. Our analysis of collective resistance provides a unified framework for understanding disparate phenomena, including Islamic schooling in sub-Saharan Africa and Indonesia, and the successful preservation of rare cultural values and belief systems by the Amish and other groups through control over their own schools.

While we focus on the education system in this paper, our model can be readily applied to other socializing institutions, including the media. Recent studies have shown that the media shapes political and social outcomes, including decreasing support for incumbent parties (Enikolopov, Petrova and Zhuravskaya, 2011), instilling nationalist beliefs (Della Vigna, Enikolopov, Mironova, Petrova and Zhuravskaya, 2014), encouraging support for extremist parties (Adena, Enikolopov, Petrova, Santarosa and Zhuravskaya, 2015), and even inciting genocide (Yanagizawa-Drott, 2014). Our framework can be adapted as follows. Rather than choosing whether to invest in education, individuals choose whether or not to tune into mainstream media sources. Alternative types who tune into mainstream media for information can tune out its cultural content through parental and other forms of socialization. In addition, if mainstream media becomes too culturally homogeneous and slanted, alternatives forms of media can emerge with the opposite slant. Of course, a full analysis of resistance to cultural control via the media would require specialized concepts and analysis, which we leave to future work.

Our analysis does not speak to the normative implications of resisting education. The desirability of attempts to transmit certain cultural traits or to resist them will vary from case to case. Indeed, precisely because education in our framework affects cultural traits, and hence preferences, the welfare consequences of resisting education may be difficult to assess. Our framework is flexible enough to permit a number of extensions, including contests among different groups over curriculum content, *joint* intergenerational transmission of human capital and cultural values, and interactions between human capital

acquisition and cultural values. For example, if acquiring human capital affects one's cultural attitudes, then the cultural dynamics could be significantly altered. We encourage future theoretical and empirical work in these areas.

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Appendix

Continuous-time limit. To define the continuous-time limit, we first generalize the dynamic given by (19) to allow for non-unitary lifespans. Specifically, let $\alpha(q_t)$ be the equilibrium probability that a child acquires the mainstream trait when the state is q_t, i.e. the right side of (19) evaluated at the equilibrium socialization levels. Suppose that after a length of time $h \in (0,1]$ a fraction h of the population have children, perform socialization, make their educational decisions, and then exit the model. The cultural dynamics are

$$q_{t+h} = q_t \cdot (1-h) + \alpha(q_t) \cdot h. \tag{A.1}$$

Rearranging the dynamic above, we obtain $(q_{t+h} - q_t)/h = \alpha(q_t) - q_t$. When α is continuous, the classic Carathéodory existence theorem provides the existence of a unique continuous-time dynamic $q(t)$ satisfying $\dot{q}(t) \equiv \lim_{h\to 0} \frac{q_{t+h}-q_t}{h} = \alpha(q_t) - q_t$ and $q(0) = q_0$.

Derivation of education cutoffs. An a type chooses $e = 1$ if

$$c \;\leq\; H + [P_a(1,\tau_{a1}) - P_a(0,\tau_{a0})]\Delta_a - \tfrac{1}{2}\left(\tau_{a1}^2 - \tau_{a0}^2\right) \equiv c_a. \tag{A.2}$$

We derived $P_a(1,\tau_{a1}) - P_a(0,\tau_{a0})$ above. We can also derive

$$\begin{aligned} \tfrac{1}{2}\left(\tau_{a1}^2 - \tau_{a0}^2\right) &= \tfrac{1}{2}\left[(1-q) - s(1-q)\right]^2 \Delta_a^2 - \tfrac{1}{2}(1-q)^2\Delta_a^2 \\ &= -s(1-q)^2\Delta_a^2 + \tfrac{1}{2}s^2(1-q)^2\Delta_a^2 \\ &= -\tfrac{1}{2}s(1-q)^2(2-s)\Delta_a^2. \end{aligned} \tag{A.3}$$

Hence the cutoff cost of education for an a type is

$$c_a = H + s(1-q)\left[1 - \tfrac{1}{2}(2-s)(1-q)\Delta_a\right]\Delta_a. \tag{A.4}$$

A b type chooses $e = 1$ if

$$c \;\leq\; H + [P_b(1,\tau_{b1}) - P_b(0,\tau_{b0})]\Delta_b - \tfrac{1}{2}\left(\tau_{b1}^2 - \tau_{b0}^2\right) \equiv c_b. \tag{A.5}$$

We derived $P_b(1,\tau_{b1}) - P_b(0,\tau_{b0})$ above. In addition,

$$\begin{aligned} \tfrac{1}{2}\left(\tau_{b1}^2 - \tau_{b0}^2\right) &= \tfrac{1}{2}\left[q + s(1-q)\right]^2 \Delta_b^2 - \tfrac{1}{2}q^2\Delta_b^2 \\ &= s(1-q)q\Delta_b^2 + \tfrac{1}{2}s^2(1-q)^2\Delta_b^2 \\ &= \tfrac{1}{2}s(1-q)\left[s + (2-s)q\right]\Delta_b^2. \end{aligned} \tag{A.6}$$

Hence the cutoff cost of education for a b type is

$$c_b = H - s(1-q)\left[1 - \tfrac{1}{2}s\Delta_b - \tfrac{1}{2}(2-s)q\Delta_b\right]\Delta_b. \tag{A.7}$$

Proof of Proposition 2.

Proof. (i) Write the dynamic as a function of s: $\dot{q}(s)$. Differentiating (20) with respect to s:

$$\begin{aligned}\frac{d\dot{q}(s)}{ds} &= q(1-q)F(c_a)\left[1-(2-s)(1-q)\Delta_a\right] \\ &\quad +sq(1-q)\frac{dF(c_a)}{ds}\left[1-(2-s)(1-q)\Delta_a\right]+sq(1-q)F(c_a)(1-q)\Delta_a \\ &\quad +(1-q)^2F(c_b)\left[1-s\Delta_b-(2-s)q\Delta_b\right] \\ &\quad +s(1-q)^2\frac{dF(c_b)}{ds}\left[1-s\Delta_b-(2-s)q\Delta_b\right]-s(1-q)^2F(c_b)(1-q)\Delta_b \qquad \text{(A.8)}\end{aligned}$$

Evaluating at $s=0$:

$$\left.\frac{d\dot{q}(s)}{ds}\right|_{s=0} = q(1-q)F(H)\left[1-2(1-q)\Delta_a\right]+(1-q)^2F(H)\left[1-2q\Delta_b\right] \qquad \text{(A.9)}$$

This is positive if and only if

$$q-2q(1-q)\Delta_a+1-q-2q(1-q)\Delta_b > 0 \qquad \text{(A.10)}$$

or rather

$$2q(1-q)[\Delta_a+\Delta_b] < 1, \qquad \text{(A.11)}$$

which holds for all $q\in[0,1]$ because $\Delta_a<1$ and $\Delta_b<1$ by assumption.

It follows that for s positive but close to zero, $\dot{q}(s)>\dot{q}(0)$ for all $q\in[0,1]$. Hence, the optimal s is positive.

(ii) Define $G^*(q)=\max_{s\in[0,1]}G(s,q)$. We establish part (ii) by showing that $G^*(q)$ has an unstable fixed point at $q=1$, has at least one other fixed point, and all other fixed points are interior.

The proof applies the envelope theorem presented in Theorem 2 of Milgrom and Segal (2002). To apply the theorem, we first note that $G(s,\cdot)$ is continuously differentiable in q and therefore absolutely continuous and differentiable for all $s\in[0,1]$. Also, the derivative $\partial G(s,q)/\partial q$ is bounded for all $s\in[0,1]$. Differentiating G in q and evaluating at $q=1$ obtains

$$\left.\frac{\partial G(s,q)}{\partial q}\right|_{q=1}=1+\Delta_b+sF(H).$$

Thus, there exists a neighborhood U of one such that, if $q\in U$, then $\partial G(s,q)/\partial q>1$ for all $s\in[0,1]$. Hence, by the envelope theorem, for $q\in U$

$$G^*(1)-G^*(q)=\int_q^1\frac{\partial G(s^*(q'),q')}{\partial q'}dq'>1-q$$

and thus because $G^*(1) = 1$, the above simplifies to $G^*(q) < q$. The Berge maximum theorem provides that $G^*(q)$ is continuous. Thus, because $G^*(0) > 0$ the conclusions follow.

(iii) In part (i) we argued that $\dot{q}_t(s^*) > \dot{q}_{t'}(0)$ at any two points in time such that $q_t(s^*) = q_{t'}(0)$. Thus, the dynamics can cross at most at one point in time since $q_t(s^*)$ can only cross from beneath $q_t(0)$. The conclusion follows from the requirement that the dynamics begin at the same state $q_0(s^*) = q_0(0) = q_0$. □

Proof of Proposition 3.

Proof. (i) Evaluating (19) at $s = 1$ and $(\Delta_a, \Delta_b) = (0, 1)$ yields:

$$\begin{aligned}\frac{d\dot{q}(s)}{ds}\Big|_{s=1} &= q(1-q)qF(c_a) \\ &\quad +q(1-q)q\frac{dF(c_a)}{ds}\Big|_{s=1} + q(1-q)^2F(c_a) \\ &\quad -q(1-q)^2F(c_b) \\ &\quad -q(1-q)^2\frac{dF(c_b)}{ds}\Big|_{s=1} - (1-q)^2(1-q)F(c_b). \quad \text{(A.12)}\end{aligned}$$

For $(\Delta_a, \Delta_b) = (0, 1)$, it is straightforward to show that $dF(c_a)/ds\big|_{s=1} = dF(c_b)/ds\big|_{s=1} = 0$. Hence

$$\frac{d\dot{q}(s)}{ds}\Big|_{s=1} = (1-q)\left[qF(c_a) - (1-q)F(c_b)\right]. \quad \text{(A.13)}$$

Note that for $s = 1$ and $(\Delta_a, \Delta_b) = (0, 1)$, $c_a = H$ and $c_b = H - (1/2)(1-q)^2$ by equations (13) and (A.7). Therefore,

$$\frac{d\dot{q}(s)}{ds}\Big|_{s=1} < 0 \iff q < \frac{F(H - \frac{1}{2}(1-q)^2)}{F(H) + F(H - \frac{1}{2}(1-q)^2)}. \quad \text{(A.14)}$$

Both sides of (A.14) are continuous in q on domain $[0, 1]$. The LHS of (A.14) increases linearly from 0 to 1 as q goes through the unit interval. The RHS increases monotonically from

$$\frac{F\left(H - \frac{1}{2}\right)}{F(H) + F\left(H - \frac{1}{2}\right)} > 0$$

to $1/2$ as q goes through the unit interval. Therefore, there exists a threshold $\hat{q} \in (0, 1/2)$ such that RHS is greater than the LHS for all $q < \hat{q}$. Hence $d\dot{q}(s)/ds\big|_{s=1} < 0$ for all $q < \hat{q}$ and $(\Delta_a, \Delta_b) = (0, 1)$.

Therefore, by continuity, for (Δ_a, Δ_b) sufficiently close to $(0, 1)$, there exists an $s < 1$ such that $\dot{q}(s) > \dot{q}(1)$ for all $q < \hat{q}$. Hence the policymaker chooses $s(q) < 1$ in such cases.

(ii) It is sufficient to show that if $F(H)^2 < F(H-1/2)$, there exists a neighborhood of $(0,1)$ such that, if (Δ_a, Δ_b) lies in this neighborhood, each interior fixed point involves $s^* < 1$.

Denote $\Delta = (\Delta_a, \Delta_b)$ and $\Delta^* = (0,1)$. Letting $Q(\Delta) \subset [0,1]$ be the set of fixed points given Δ, Lemma A.2 below implies that Q has a closed graph. Let $S(q,\Delta) \subset [0,1]$ be the set of maximizers given (q,Δ) which the Berge Maximum Theorem and the Closed Graph Theorem imply must also have a closed graph.

For a contradiction, suppose there exists a sequence $\Delta^n \to \Delta^*$ and $\hat{q}^n \in Q(\Delta^n)$ such that $S(\hat{q}^n, \Delta^n)$ contains 1 for all n. As the graph of Q is closed, then (passing to a subsequence if necessary) there exists $q^* \in Q(\Delta^*)$ such that $\hat{q}_n \to q^*$. From the proof of Proposition 2(ii), it is clear that q^* must be interior and thus $1 \notin S(q^*, \Delta^*)$ by Lemma A.1. But this entails a contradiction since $(\hat{q}^n, \Delta^n) \to (q^*, \Delta^*)$ and $1 \in S(\hat{q}^n, \Delta^n)$ for all n implies $1 \in S(q^*, \Delta^*)$ since S has a closed graph. □

LEMMA A.1. *Assume $F(H)^2 < F(H-1/2)$ and $(\Delta_a, \Delta_b) = (0,1)$. Then for any initial position q_0, there is a time t_0 such that, if $t \geq t_0$, then $s^* < 1$.*

Proof. From the previous proposition, the dynamics converge deterministically to an interior fixed point $q^* \in (0,1)$ and thus, for every neighborhood U of q^*, there is time t_0 such that $q(t) \in U$ for all points in time $t \geq t_0$. Notice that if setting $s = 1$ is suboptimal at a fixed point, then because the policymaker's objective is continuous, then setting $s = 1$ remains suboptimal in a neighborhood of the fixed point. Our argument therefore proceeds by showing that under the hypotheses of the proposition, there cannot be an interior fixed point with $s^* = 1$.

To the contrary, suppose that there is an interior fixed point q^* at which $s^* = 1$ is optimal. This implies that

$$\dot{q} = -q^{*2}(1-q^*) + q^*(1-q^*)F(H) - q^*(1-q^*)^2 F\left(H - \frac{1}{2}(1-q^*)^2\right) = 0$$

$$q^* = \frac{F(H) - F\left(H - \frac{1}{2}(1-q^*)^2\right)}{1 - F\left(H - \frac{1}{2}(1-q^*)^2\right)}. \tag{A.15}$$

From the policymaker's problem, we have that $\partial \dot{q}/\partial s|_{s=1,q^*} < 1$ if and only if

$$q^* F(H) - (1-q^*) F\left(H - \frac{1}{2}(1-q^*)^2\right) < 0. \tag{A.16}$$

Rearranging terms, we find equation (A.15) and this inequality simultaneously hold if and only if

$$F(H)^2 < F\left(H - \frac{1}{2}(1-q^*)^2\right). \tag{A.17}$$

As the right side is strictly increasing in q^*, the inequality is guaranteed to hold at the fixed point if the inequality holds when we set $q^* = 0$, that is

$F(H)^2 < F(H - 1/2)$. This implies a contradiction as setting $s^* = 1$ is then suboptimal. □

LEMMA A.2. *Suppose $f : X \times Y \to X$ is continuous and both $X \subset \mathbb{R}^m$ and $Y \subset \mathbb{R}^n$ are compact. Then $\{(x, y) \in X \times Y : f(x, y) = x\}$ is closed.*

Proof. Define $g : X \times Y \to X \times Y$ to be the continuous function satisfying $g(x, y) = (f(x, y), y)$. By the closed graph theorem (Aliprantis and Border, 2006, Theorem 17.11), because g is a continuous function from a topological space into a compact Hausdorff space, its graph is closed. By Aliprantis and Border (2006, Lemma 17.51), the set of fixed points of g has a closed graph. □

Continuous-time limit under collective resistance. To ensure that the continuous-time limit of the dynamic remains well defined in the extension with collective resistance, it sufficient to verify that $\max_{s_a} q_t(s_a, s_b = 1, q_{t-1})$ is continuous in q_{t-1}. Let $S_{\mathcal{I}}(q) \subset [0, 1]$ denote the set of inclusive strategies and $S_{\mathcal{E}}(q) = [0, 1] \backslash S_{\mathcal{I}}(q)$ the set of exclusive strategies when $q_{t-1} = q$. When $E > \Delta_b - (1/2)\Delta_b^2$, then all strategies are inclusive for all q, in which case, the dynamics coincide with those in the model without collective resistance. When $E < \Delta_b - (1/2)\Delta_b^2$, then the set of exclusive strategies is nonempty for all q. In any neighborhood of q in which either $S_{\mathcal{E}}(q) = [0, 1]$ or both $S_{\mathcal{I}}(q)$ and $S_{\mathcal{E}}(q)$ are nonempty, standard arguments provide that $\max_{s_a} q_t(s_a, s_b = 1, q_{t-1})$ is continuous. A discontinuity can only occur at a point q^* for which $S_{\mathcal{I}}(q)$ is nonempty for $q \leq q^*$ and empty for $q > q^*$, implying that the only inclusive strategy at q^* involves no strictness, i.e. $S_{\mathcal{I}}(q^*) = \{0\}$. If the optimal policy at q^* is exclusive, then $\max_{s_a} q_t(s_a, s_b = 1, q_{t-1})$ remains continuous at q^* and the continuous-time limit of the dynamic is well defined. Following similar arguments to those in Lemma A.4, a sufficient condition for an exclusive policy to be optimal at q^* is

$$\Delta_a < \frac{(1 - \sqrt{1 - 2E})\Delta_b}{1 - \sqrt{1 - 2E} - \Delta_b},$$

which is evidently satisfied when Δ_a is small and Δ_b is large.

Proof of Proposition 4.

Proof. Let $S(q)$ denote the strictness levels that are best replies for the policymaker when the fraction of mainstream types is $q \in (0, 1)$ in the presence of collective resistance. Each best reply $s_a \in S(q)$ is either (a) inclusive and *does not* bind the alternative types' participation constraint $E > \bar{E}$, (b) inclusive and *does* bind the alternative types' participation constraint $E = \bar{E}$, or (c) is exclusive.

In the case of (a), plainly the dynamics coincide. In the case of (b), the inequality must hold because the policymaker's constrained optimum cannot exceed the unconstrained optimum. Finally, to verify the conclusion in the case of (c), let $\dot{q}(s_a)$ denote the original dynamic without collective resistance given

by (20) and $\dot{q}^\dagger(s_a)$ the dynamic with collective resistance given by (19). Let s_a^* denote an unconstrained maximizer for the inclusive dynamic and $\hat{s}_i$ the i-policymaker's equilibrium strictness with the collective resistance dynamic for a given $q \in (0,1)$ and $i \in \{a,b\}$. From these definitions, we have $\dot{q}(s_a^*) \geq \dot{q}(\hat{s}_a)$. Using this inequality, we now argue that $\dot{q}(s_a^*) > \dot{q}^\dagger(\hat{s}_a)$.

Observe that $\dot{q}(\hat{s}_a) > \dot{q}^\dagger(\hat{s}_a)$ if and only if

$$\hat{s}_a(1-q)^2 F(c_b)\left(1-\hat{s}_a\Delta_b-(2-\hat{s}_a)q\Delta_b\right) > -q(1-q)F(\hat{c}_b)(1-q\Delta_b) \quad \text{(A.18)}$$

which is guaranteed to hold for all $0 \leq \hat{s}_a \leq 1$, $0 < q < 1$, and $0 < \Delta_b < 1$ whenever the participation of alternative types is higher with collective resistance $F(c_b) \leq F(\hat{c}_b)$. This is true because alternative types opt for alternative education when $s_a = \hat{s}_a$, implying $c_b(\hat{s}_a) \leq \hat{c}_b(\hat{s}_a)$. Thus, $\dot{q}(s_a^*) \geq \dot{q}^\dagger(\hat{s}_a, \hat{s}_b)$ which, integrating over time yields the desired conclusion $q \geq q^\dagger$.

Finally, it is straightforward to show that for a set of initial conditions q_0 and net benefits from mainstream education E with positive measure, the system begins in a state where alternative types strictly prefer alternative education for every level of strictness, in which case, for every strategy of the policymaker there is positive amount of time in which case (c) obtains. For such parameters, the desired inequality is strict $q > q^\dagger$ for all $t > 0$. □

Proof of Proposition 5.

Proof. Supposing $E < 1/2$, from Lemmas A.3 and A.4 below, there exists a neighborhood of the point $(0,1)$ such that, if it contains (Δ_a, Δ_b), then there is a value $0 < \hat{q} < 1$ for which $q \leq \hat{q}$ implies that the a-type policymaker's strategy is inclusive and at $\hat{q}$, the policy is indifferent between the optimal inclusive strategy and the exclusive strategy with $s_a = 1$. We wish to show that the optimal inclusive strategy at $\hat{q}$ strictly binds the b-types' participation constraint, meaning that the level of strictness is less than the optimal level in the absence of collective resistance.

Toward a contradiction, suppose that the unconstrained optimal policy remains optimal at $\hat{q}$. Using the notation from the proof of Proposition 4, we know that this level of strictness s_a^* must do just as well as setting strictness equal to one: $\dot{q}(s_a^*) \geq \dot{q}(1)$. However, from inequality (A.18), we know that $\dot{q}(1) > \dot{q}^\dagger(1)$. But this entails a contradiction since the a-type policymaker is indifferent between inclusive and exclusive policies, $\dot{q}(s_a^*) = \dot{q}^\dagger(1)$. Thus, it must be that at $\hat{q}$, the unconstrained optimum s_a^* fails to satisfy the constraint $E < \bar{E}$. But this means that the constrained optimum lies below s_a^*. Moreover, this conclusion must likewise hold for all $q \leq \hat{q}$ in a neighborhood of $\hat{q}$. □

Lemma A.3. *For Δ_a in a neighborhood of zero, the optimal exclusive strategy for the a-policymaker is $s_a = 1$ for all $q \in (0,1)$.*

Proof. When $\Delta_a = 0$, then for all $q \in (0,1)$, $d\dot{q}_2/ds_a \propto F(c_a) = F(H_a) > 0$ and thus $s_a = 1$ is the unique maximizer. By Berge's theorem, for every neighborhood U of $s_a = 1$, there exists a neighborhood V of zero so that the unique maximizer lies in U whenever $\Delta_a \in V$. Also, because $d\dot{q}_2/ds_a|_{s_a=1} \propto F(c_a) + f(c_a)(1-q)\Delta_a(1-(1-q)\Delta_a) > 0$ for all $0 \leq \Delta_a, q \leq 1$, there exists a neighborhood U' of $s_a = 1$ for which the objective is strictly increasing in s_a for all $0 \leq \Delta_a, q \leq 1$. Thus, letting V' be the neighborhood of $\Delta_a = 0$ for which $\Delta_a \in V'$ implies that the unique maximizer lies in U', the unique maximizer is $s_a = 1$. □

Lemma A.4. *Fix $s_b = 1$ and suppose $\Delta_a = 1 - \Delta_b = 0$. If $E \geq 1/2$, then all types adopt mainstream education. If $E < 1/2$:*

1. *For $q > 1 - \sqrt{1-2E}$, all strictness levels are exclusive for the $a-$policymaker.*
2. *There is a value $q^* < 1 - \sqrt{1-2E}$ for which, $q \in \left(q^*, 1 - \sqrt{1-2E}\right)$ implies that the a-policymaker adopts an exclusive strategy.*
3. *For q small enough, the $a-$policymaker adopts an inclusive strategy.*

Proof. The highest s_a keeping alternative types in mainstream education satisfies $E = \bar{E}$, i.e.,

$$E = q[1 - q + \frac{1}{2}q] + s_a(1-q)[1 - q - \frac{1}{2}s_a(1-q)]$$
$$E = q(1 - \frac{1}{2}q) + s_a(1-q)^2(1 - \frac{1}{2}s_a).$$

If $E \geq \max_{s_a,q} \bar{E} = 1/2$, then the alternative type always obtains mainstream education, proving the first claim.

Now assume $E < 1/2$. For high values of $q \in (1 - \sqrt{1-2E}, 1)$, no s_a can lure the alternative type to acquire mainstream education. At the lower bound of this interval $q = 1 - \sqrt{1-2E}$, the only inclusive strategy requires $s_a = 0$ which yields the dynamic $\dot{q}_1 = -q^2(1-q)$. From the preceding lemma, we know that the optimal exclusive strategy is $s_a = 1$ which yields the dynamic

$$\dot{q}_2 = -q^2(1-q) + q(1-q)F(H_a) - q(1-q)^2F(\hat{c}_b).$$

Thus, the a-policymaker adopts an exclusive strategy at this point if and only if $\dot{q}_2 > \dot{q}_1$, equivalently $F(H_a) - (1-q)F(\hat{c}_b) > 0$. Since $\hat{c}_b = H_b - \kappa + q(1 - (1/2)q)$. Substituting the value $q = 1 - \sqrt{1-2E}$ into the expressions, we have

$$H_a = H_b - \kappa - q(1 - \frac{1}{2}q)$$

and thus

$$F(H_a) - (1-q)F(\hat{c}_b) = qF(H_a) > 0.$$

This implies that the exclusive strategy is strictly preferred at $q = 1 - \sqrt{1 - 2E}$. By another simple application of Berge's Theorem, we can conclude that there exists an interval $(q^*, 1 - \sqrt{1 - 2E})$ of q whereby the $a-$policymaker adopts the exclusive strategy.

Finally, we now show that an inclusive strategy is optimal when q is small. The a-policymaker strictly prefers an inclusive strategy whenever $\dot{q}_1 > \dot{q}_2$, that is

$$\begin{aligned} -q^2(1-q) + s_a q(1-q)F(H_a) + s_a(1-q)^2 F(c_b)(1 - s_a - (2-s_a)q) \\ > -q^2(1-q) + q(1-q)F(H_a) - q(1-q)^2 F(\hat{c}_b). \end{aligned}$$

As $q \to 0$, the inequality holds if and only if $s_a(1 - s_a)F(c_b) > 0$. Thus, the a-policymaker does strictly better by choosing a positive but inclusive level of strictness satisfying $E \geq \bar{E}$ than by being exclusive for q in a neighborhood of zero. □