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# The economics of identity: The origin and persistence of racial identity norms

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**Abstract**

This study uses evolutionary game theory to model the relationship between racial identity formation and inter-racial disparities in economic and non-economic outcomes. Starting with a fixed population of persons who are easily identified according to an exogenous criterion, for example, phenotype, we then allow individuals to pursue either a racialist or an individualist identity strategy in social interactions. The formation of identity norms imposes both positive and negative externalities on each person's identity actions. There are forces in the model that might push society toward racialism, individualism, or a mixed identity equilibrium, depending on matching assumptions, dynamic assumptions, parameter values, and initial conditions.


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## 1. Introduction

This study uses evolutionary game theory to model the relationship between racial identity formation and inter-racial disparities in economic and non-economic outcomes. Black–White disparities of varying magnitudes persist for various economic outcome indicators including earnings, income, and wealth holdings. These prolonged differentials continue to exist despite the virtual elimination of differences in levels of educational attainment among younger cohorts. Hyper-residential segregation in many metropolitan areas reinforces a variety of discriminatory mechanisms that are partially implicated in generating differential economic outcomes. While there is a large body of literature that examines racial economic discrimination, existing models provide little guidance in understanding why discriminatory behavior appears intransigent. We argue that a racial identity formation process is strongly implicated in normalizing disparate economic outcomes.

Unlike the time path of many inter-racial economic differentials, the magnitude of the Black–White wealth differential has been increasing monotonically with the Black/White wealth ratio exhibiting remarkable stability over time. Hurst et al. (1996) have shown that in 1994, 30 percent of African American households had zero or negative net worth, compared to only 8 percent of White families.[1] The median wealth of African American families was US$ 10,329, while the median for White American households was US$ 76,519. Thus, the median White family had a net worth near the 84th percentile of the Black wealth distribution (US$ 79,048); yet, a family would have required net worth of at least US$ 310,081 in order to enter the White elite (those at or above the 84th percentile). Finally, the median Black family places at just the 22nd percentile of the White wealth distribution (US$ 10,539). During 1984–1998, the mean Black/White wealth ratio remained steady at 18–19 percent, but it declined to 16 percent in 2001 (Wolff, 2001; Straight, 2002; Aizcorbe et al., 2003). However, the Black/White ratio of median family wealth showed considerably improvement, rising from 0.02–0.03 during 1984–1994 to 0.14–0.16 during 1995–2001.

We believe that this wealth gap reflects the cumulative effects of both past and present racism. Moreover, these wealth differences provide material incentives that encourage the continual reproduction of racism in American society. On one hand, race is a form of individual and group property, that is, a wealth-generating characteristic.[2] On the other hand, race is also a form of personal identity, that is, a produced good whose demand is responsive to changes in the costliness of racial identity. Hence, this paper seeks to construct an alternative to the more ephemeral "tastes for discrimination" approach to the genesis of racial economic disparity.

We use evolutionary game theory to construct a formal model of the relationship between wealth accumulation and racial identity. Modern physical anthropology has rejected the notion of race as a biologically meaningful concept. Consistent with modern physical

[1] Oliver and Shapiro (1995) provide a detailed sociological treatment of the extent and origin of Black–White wealth inequality. See also Blau and Graham (1990) for an economic analysis of Black–White wealth inequality. The wealth levels presented by Hurst et al. are higher than those generally found in the literature. Hurst et al. used information obtained from the Panel Study on Income Dynamics, while most other studies utilize information obtained from the federal government, such as the Survey of Income Program Participation.

[2] See Harris (1993) for an insightful exposition of the legal history of Whiteness as property.

anthropology, we seek to evaluate the persistence of racial identity as a social norm. When race is included in an economic model, the usual assumption is that a person's race is exogenously given. For simplicity, models are often limited to two social categories, say "Europeans" and "Africans." Consider a second racial dimension that is endogenous. Each person is either an "individualist" or a "racialist." Individualists do not participate in the "in-group" behavior of his or her social group, but rather attempt to live as if they are race-free, even though their exogenous social group identity is in fact observable and has consequences. A racialist chooses to identify with his or her social group and thus to participate in whatever costs and benefits are conferred by group membership.

The population of agents divides into four categories: European individualists, European racialists, African individualists, and African racialists. We refer to Europeans racialists as "Whites" and African racialists as "Blacks." Thus, race is two-dimensional. One dimension is exogenous and geographically rooted (African versus European). The second dimension is endogenous and socially constructed (individualist versus racialist).

The model is an evolutionary game. The proportional division of the population between African and European is exogenous and fixed over time. Within each social group, the division between individualists and racialists evolves endogenously. Thus, the two key endogenous variables in the model are: (i) the fraction of Whites and (ii) the fraction of Blacks. These variables are denoted $\mu_t^{\mathrm{w}}$ and $\mu_t^{\mathrm{b}}$.

Time is discrete. People meet in pairs according to a matching assumption that allows within-group meetings (African-to-African and European-to-European) to occur with different probability than between-group meeting (African-to-European). A meeting results in a payoff to each of the two participants in the meeting. The payoffs are interpreted as results of economic production. Each person utilizes his or her own individual productive abilities in these social interactions, and each person has greater or lesser access to some portion of group resources that he or she may draw upon to enhance productive potential. In particular, people engage in social interactions with resources that are provided to (or withheld from) them by their families, other nurturing groups, and those who support a particular identity action. Since there are four categories, there is a $4 \times 4$ payoff table. The population frequencies $\mu_t^{\mathrm{w}}$ and $\mu_t^{\mathrm{b}}$ evolve in response to average payoffs by category. The specific assumption is a replicator dynamic. Through numerical simulations for various settings of the parameters and initial conditions, we investigate questions about model behavior. Will $\mu_t^{\mathrm{w}}$ and $\mu_t^{\mathrm{b}}$ approach an extreme (zero or one)? Will Africans or Europeans have greater payoff success in the longer run?

For intuition, consider some extreme cases of matching. If matching were only within groups, Africans with Africans and Europeans with Europeans, separate coordination games arise for both groups if there is a positive net benefit to racialist behavior. Thus, in this extreme case, depending on initial conditions, we might expect Europeans to adapt to either complete Whiteness or complete individualism. Similarly, we might expect Africans to become completely Black or completely individualists.

As a different extreme case, suppose matching were only between groups, Africans matching only with Europeans, and vice versa. In this case, the model becomes a prisoner's dilemma. Racialism dominates for both Africans and Europeans, even though each group would be better off if its members could somehow agree to adhere to individualism.

As these extreme cases suggest, there are forces in the model that might push either group toward racialism or toward individualism, depending on matching assumptions, dynamic assumptions, parameter values, and initial conditions. The construction of racial identity is the result of both intra- and inter-group interaction. Persons pursuing a racialist strategy are altruistic toward own-group members but antagonistic toward other-group members. Persons pursuing an individualist strategy are neither altruistic nor antagonistic toward other persons. A social norm forms from the random interaction of persons, with each person staying with or changing to the strategy with above average fitness. Social fitness is measured by the impact of racial identity on wealth accumulation.

As a racialized social norm is being established, a person's decision to accept or reject a racialized identity depends on the extent to which others accept or reject a racialized identity. The construction of identity by all others in society imposes both positive and negative externalities on each person's identity actions. Consequently, the set of feasible racial identities that a person may assume is conditional on the person's characteristics such as skin color, phenotype, and sex that may lead others to treat the person in a particular fashion or to impose an external set of behavioral expectations on the person. For example, a very dark complexioned Latino with African or Indian phenotype may choose to acculturate into American society with a Protestant, English-only cultural identity, complete with "typical" modes of dress, and so on, but current social norms do not allow such an individual to become "White."

## 2. Identity formation: social and behavioral sciences other than economics

Contemporary anthropological perspectives on race are exemplified by Szwed's (1975, p. 25) assertion that behavior previously thought of as being "caused by physical form" is actually "learned behavior organized at many communicative levels, each cross-referencing the other." This modern conception of race thus rejects racial identity based on biologically rooted characteristics.

Psychologists use a similar approach that is consistent with cognitive models of the relationship between an individual and a reference group. Miller and Prentice (1994, p. 451) insist, for example, that some psychologists have shifted the focus of research from how individuals behave in groups to how "groups behave within individuals." Similarity/attraction theory is one of several frameworks used by psychologists to model the process by which individuals identify with groups. According to this theory, in a situation characterized by free choice, individuals tend to prefer interactions with others perceived as similar to themselves (Blau, 1977; Triandis, 1960).

The question then becomes how individuals make decisions regarding similarity/dissimilarity. Social categorization theory suggests that the most observable characteristics, physical characteristics such as phenotype and sex, are typically the most salient dimensions available to an individual to categorize others (Turner, 1982). An individual will be expected to prefer identification with those persons with whom salient categories are shared. If these categories were immutably fixed and individuals were not allowed to alter their initial identification choices, then the traditional economics model could be considered a reasonable approximation of observed patterns of interaction. However, psychological and anthropological research provides no support for such a static model of group identification.

Turner et al. (1994) argue that the emergence of groups, per se, entails a shift in individuals' self-perception from personal to racial identity. These authors argue that the self-categorizing that precedes group formation "is inherently variable, fluid, and context dependent, as self-categories are social, comparative and are always relative to a frame of reference" (p. 454). The process of identification with a group is endogenously determined by changes in relevant social parameters.

In the case of racial identity, per se, since the early 1970s, psychologists have studied changes in the nature and intensity of individuals' attachment to what can be described as a composite Black identity. It is unlikely that racial identity formation follows the hyper-rationalized choice theoretical framework that is common among economists. Rather, individual racial identity formation is more likely to be an evolutionary utility-increasing process instead of a one-shot utility-maximizing process. Individuals do not instantaneously know which identity will maximize lifetime satisfaction. Among others, Cross (1971, 1991) and Helms (1990) have explored the extent to which individuals proceed through several stages of racial group identification, each with different intensities and characteristics. These models generally incorporate the hypothesis that critical life events can precipitate a change in the intensity of identification with a racial reference group. This same type of framework has been applied to other racial/ethnic groups in the USA including Asians, Hispanics, and Whites. In all cases, individuals are hypothesized to have the capacity to alter the intensity of their identification with a racial reference group in response to changes in external stimuli.

Information used by individuals to form decisions regarding identity at any given point in time originates from a variety of sources including families, friends, neighbors, co-workers, group affiliations, media, and so on. Information from different sources may be contradictory in terms of the indicated identification outcome. Also, the weight attached to each information source may vary as a result of changes in an individual's opportunity set, significant life events, or changes in macro-level constructs.

Once individuals have formed social identities, the foundations for inter-group conflict exist. McAdams (1995, p. 1007) even argues that groups use intra-group status rewards as a non-material means of gaining material sacrifice from members. Thus, individuals value the opinions of the groups to which they belong and seek to be acknowledged as members in good standing. However, in the case of interaction with other groups, McAdams argues that discrimination is a means by which social groups produce status for their members. The desire for status within the group is the mechanism that yields sufficient intra-group cooperation to make inter-group discrimination effective. This dynamic provides an incentive for groups to make status enhancing/protecting investments or racial identity formation.

## 3. Economics and racial identity: framing the issue

While anthropology and psychology (as well as sociology and cultural studies) subscribe to a model of racial identity emphasizing cognitive processing and learned associations, mainstream economics remains wedded to the treatment of race as a fixed parameter ascribed to an individual. A racial group can then be treated simply as the aggregation of those individuals identified by the classifying parameter. Therefore, the process by which an individual identifies with a particular group is strictly passive.

Within the confines of this framework, the central research focus has been quantification of the magnitude of differential returns to various racial identities. Since alteration of assigned racial identities is presumably precluded, strategies available to individuals to compensate for differential returns are limited largely to self-investments in other income and wealth-generating characteristics (e.g. human capital). This framework ignores important implications that arise when the relationship between individuals and groups is modeled more accurately.

Accordingly, the traditional economics framework cannot explain the formation and persistence of social norms regarding racial identity. Often, these social norms have been codified by public policy. For example, in the USA, the records of governmental specification of rules of racial identity associated with peoples of African descent were established both through legislation and court decisions. Racial sub-classifications differentiating among African Americans included the categories mulatto, quadroon, and octoroon, categories that purported to designate an individual's degree of African ancestry. These were given official status not only to distinguish patterns of descent, but also to assign differential opportunities. The obvious questions for economists are how economic processes affect racial identity and classification and what is the impact of identity formation on economic processes.

Similar classification schemes emerged in many South American countries, although governmental entities were generally less involved in the direct allocation of differential opportunities than in the USA. In the USA, few individuals with African ancestry could effectively choose to identify themselves as exclusively White (by passing). Individuals with mixed ancestry generally enjoyed enhanced economic status and had some, albeit limited, degree of latitude in choosing a composite identity configuration. In many Latin American countries, conscious efforts were made to absorb elements of African culture into a composite culture with a European overlay. Such a process does not reduce the salience of racial identity; rather, it reflects a refusal by some persons of African ancestry to be classified as Black (Falcon, 1995; Forbes, 1992; Telles and Lim, 1998; Rodriguez-Morazzani, 1998). In the Latin context, it is not uncommon for persons with apparently observable African ancestry to self-classify themselves as White. At the same time, social processes generating disparate opportunities based on phenotype have not been eliminated. Consequently, lighter skinned individuals generally enjoy higher social and economic status than their darker skinned counterparts. Thus, darker skinned individuals who choose to identify as White still are unable to capture completely all of the income and wealth-generating dimensions of White identity.

In South Africa, the racial identity scheme was tightly and officially constructed, especially during the apartheid era (1948–1994). All persons were officially assigned to one of four racial identities: White, colored, Indian, and African. This designation regulated access to occupations, schooling opportunities, residential locations, and so on. Marriages across racial groups were prohibited. Efforts were made to disunite political opposition by encouraging individuals to identify with traditional ethnic groupings such as Xhosa and Zulu. Individual ethnic groups were accorded both official recognition and designated geographical and political jurisdictions. Many politically conscious members of the three non-White groups countered this strategy by creating a composite "Black" identity to unify opposition to the apartheid regime. Thus, many individuals designated as colored or Indian

as well as African self-defined themselves as "Black" during and after the anti-apartheid struggle.

South African authorities constructed a composite "White" identity that encompassed individuals belonging to both major "European" ethnic groups, English and Afrikaaners. Given the "tribal" differences among Blacks, the composite White classification was designed in part to support the claim that Whites constituted the single largest ethnic population in South Africa and thus had a right to govern. Although historically there were (are) significant differences between English and Afrikaaner cultures, over time many individuals from both groups identified increasingly with the composite White identity.

The development of White identity in the USA also involved dislocation of traditional ethnic identities. In particular, cultural studies researchers have documented how some European immigrant groups, particularly the Irish, initially were classified as belonging to a distinct and inferior race and were denied the benefits accruing to individuals whose ethnic origins were evaluated favorably. Allen (1994, p. 22) argues that "Irish history presents a case of racial oppression without reference to alleged skin color or, as the jargon goes, 'phenotype'."

Allen argues that labor competition between Blacks and Irish in the 1850s "began as a form of normally occurring wage labor competition" but "soon developed on the Irish American side into an assertion of the right of 'White' preference." More generally, Jacobson (1998, p. 91) argues that "a pattern of racially based, Anglo-Saxonist exclusivity dominated the years from 1840 to the 1920s, whereas a pattern of Caucasian unity gradually took its place in the 1920s and after." This collective White identity significantly reduced the previous variance that had been associated with concepts of identity among peoples of European descent. As Jacobson (1998, p. 92) observes, "between the 1920s and the 1960s, concerns of 'the major divisions' [of the human species] would so overwhelm the national consciousness that the 'minor divisions,' which had so preoccupied Americans during the period of massive European immigration, would lose their salience in American culture and disappear altogether as racially based differences."

There is, then, a dimension of choice involved in racial identification. However, macro-level social processes define the choice set and constrain the social and economic implications of individual identity choices. These macro-level processes include customary and legal racial identity rules that assign persons to racial categories and restrict opportunities for social intercourse, market processes that generate differential returns across racial identities, and social learning processes that transmit information to individuals used to make racial identification choices.

One way of interpreting the progressive inclusion of ethnic groups into the fraternity of Whiteness is that "initiation" confers access to enlarged income and wealth-generating opportunities, or what some legal scholars define as property rights in Whiteness. Harris (1993, p. 1761) argues that "the law has recognized and codified racial group identity as an instrumentality of exclusion and exploitation while refusing to recognize group identity when asserted by racially oppressed groups as a basis for affirming or claiming rights." Further, she contends, this approach has reproduced subordination by assigning a racial identity equated with inferior status in the past. The result, according to Harris, has been the creation of a de facto "property right" in Whiteness protected by limiting the type of relief available to oppressed groups (p. 1768). Protection of the property interest in Whiteness is

achieved, in part, by treating race as "immutable and biological" and by "treating Whiteness as the basis for a valid claim to special constitutional protection" (pp. 1768, 1775).

An important economic implication of the preceding discussion is that the construction of racial identity, for example, the transformation of ascriptive characteristics into capital, has economic value. As demonstrated in the examples discussed above, all social identities are malleable to some degree. Nevertheless, exclusivity, restricted mobility, and differential economic opportunity continue to delimit racial categories. These processes transform skin color from a non-economic physical attribute into a racialized commodity that has considerable implications for both wealth accumulation and personal identification. Although racial categories are biologically arbitrary, they are deliberate social constructions. Racial lines are drawn to accomplish socioeconomic divisions, so we should not be surprised at the stubborn persistence of racial inequalities. Racial boundaries are constructed to create differential economic opportunities.

## 4. The economics of racial identity as a social norm

Our contention that racial identity is endogenous does not imply that there are no social constraints. On the contrary, there are norms associated with racial construction. It is precisely the stability of these norms that we wish to investigate. For example, persons of African descent may decide whether they wish to establish a "Black" identity or whether they wish to interact with others solely as "individuals," but prevailing social norms may not permit persons of African descent to become "White," at least not in the USA. However, as previously suggested, in some countries such as Brazil, persons of African phenotype may have the option of selecting Whiteness. To paraphrase Marx, "individuals construct their own identity, but they do not construct their identity just as they please; they do not construct it under circumstances chosen by themselves, but under circumstances encountered, given and transmitted from the past. The traditions of all the dead generations weigh like a nightmare on the brain of the living" (Marx, 1963, p. 15). At a given point in time then, social norms establish the identity strategies that are available to individuals; yet, as we will see, the competitive survival of the fittest strategies will influence the construction and replication of social norms. In the historically specific context of the USA, Americans of European descent have used their political economic dominance to construct barriers to entry into and barriers of exit from "Whiteness." Conversely, in this social context, "Blackness" is the ultimate non-White social construct; it is an antithetical residual category for those persons with the least access to the presumptive privileges of the property rights inherent in Whiteness. Non-Whiteness then is a social construction for limiting competitive challenges for Whites.

A wide variety of scholars have contributed to the literature on the social construction of race: social and behavioral scientists, humanists, and critical legal theorists. A preliminary version of this paper (Darity et al.) discusses some of that literature. That discussion allows us to draw a number of conclusions:

- Identity formation, especially racial identity, is a psychological and socioeconomic process, not a biological datum.
- Identity formation allows "groups to behave in individuals."

- Individuals prefer interaction with others perceived as identical with themselves.
- Observable characteristics, such as phenotype and sex, are salient features that may permit individuals to characterize others as similar or different.
- The intensity of an individual's identification with a group is an endogenous process that responds to economic incentives.
- Identity formation is a multistage process.
- Nurturing groups (families, friends, neighbors, social groups, and co-workers) provide or withhold information, financial resources, time, and status as a means of inducing individuals to adhere to the group.

Stewart (1997) provides the initial attempt to formalize an economic analysis of identity. He argues that the intensity of racial–cultural identity of individual $i$ of group $j$ ($\mathrm{RCI}_j^i$) is a commodity that should be included in the individual's utility function. Using Becker's household production framework, Stewart made the following suggestions[3]:

(a) An individual's racial/cultural identity can be modeled as a commodity produced through the use of market goods and services and own time.
(b) Racial/cultural identity is interrelated with other dimensions of an individual's core identity such as gender, religion, class, and individuals prioritize identity dimensions and choose technologies of commodity production to maximize well-being.
(c) Individuals produce racial/identity using a technology of production consisting of customary processes identified from a public stock of pre-existing cultural knowledge and modifications to those processes introduced as a result of current efforts to enhance identity.
(d) Individuals' private production of racial/cultural identity concurrently produces an externality with public goods characteristics that augments the stock of collective racial/cultural identity for group members.
(e) Both the private production of racial identity by members of one group and the negative externalities associated with that private production (collective identity) can diminish the production of identity by other groups.

[3] Eqs. (i) and (ii) present the utility and identity production functions of Stewart's model.

$$U_i = U_i(\mathrm{RCI}_1^j, x), \tag{i}$$

where $i = 1, \ldots, n$; $j = A, B$; $\delta U_i/\delta(\mathrm{RCI}_1^j) > 0$, $\delta U_i/\delta x > 0$, $\delta^2 U_i/\delta(\mathrm{RCI}_1^j)^2 < 0$, $\delta^2 U_i/\delta x^2 < 0$; and

$$\mathrm{RCI}_i^j = f(Z, \mathrm{RCG}^j, \mathrm{RCG}^{-j}), \tag{ii}$$

where $Z$ is the elements of an individual's identity other than race-culture, $\mathrm{RCG}^j$ the social stock of own-group racial–cultural identity and $\mathrm{RCG}^{-j}$ is the social stock of other-group racial–cultural identity, $\delta \mathrm{RCI}_1^j/\delta \mathrm{RCI}^j > 0$, $\delta^2 \mathrm{RCI}_1^j/\delta(\mathrm{RCG}^j)^2 > 0$, $\delta \mathrm{RCI}_1^j/\delta \mathrm{RCG}^{-j} < 0$, and $\delta^2 \mathrm{RCI}_1^j/\delta(\mathrm{RCG}^{-j})^2 < 0$.
Given Eqs. (1) and (2), along with the individual's budget constraint, time constraint, other commodity production functions, we can derive the individual's demand for identity as a function of time, input prices, $Z$, $\mathrm{RCG}^j$, and $\mathrm{RCG}^{-j}$. Finally, since the stock of own-group racial–cultural identity is just a composite of individual demand for identity, the net change in the stock of own-group identity between periods $t$ and $t-1$ is

$$\Delta \mathrm{RCI}_i^{j,t} = v(\mathrm{RCI}_1^{j,t}, \ldots, \mathrm{RCI}_n^{j,t}) - \mathrm{RCI}_n^{A^*,t-1}, \tag{iii}$$

where $\mathrm{RCG}^{j,t} = v(\mathrm{RCI}_1^{j,t}, \ldots, \mathrm{RCI}_n^{j,t})$.

Stewart's model provides several innovations. First, it draws attention away from the outdated notion that race is a biological concept; hence, Stewart uses "racial–cultural" identity as well as an identity production function. Second, presenting individual racial–cultural identity as a direct argument of individual utility or personal satisfaction opens the way for extensions of the model to show the impact of identity on the demand for all other goods and services. Third, the identity formation of individuals is affected by the prevailing norms of own- and other-group racial–cultural identity. Intertemporal change in the stock of own-group racial–cultural identity is a complex composite of individuals' demands for identity; hence, identity construction is both an individual and a group process.

Akerlof and Kranton (2000) simplify the theory of identity by pairing away the household production framework from the most basic version of the model, but otherwise use utility and identity production functions that are innovative refinements of Stewart. Specifically, for Akerlof and Kranton, individual utility is a function of identity and the actions taken by the individual and the actions taken by all other individuals. They then suggest that the identity of individuals is determined by their own actions and the actions of others, within the context of the social categories assigned to individuals, the prescriptive behavior associated with assigned social categories, and the quality of the match between an individual's own characteristics and the socially determined ideals of the individual's assigned category. Individuals in this model choose both their identity and their actions. Akerlof and Kranton use a dynamic game model to establish the nature of identities that will prevail with alternative equilibrium actions.

The Akerlof and Kranton model provides an interesting development of the issues raised by Stewart, even as it changes the nature of the question pursued in the Stewart model. The latter model has racial identity and the reproduction of racism as its target of explanation, Akerlof and Kranton focus on the explanation of acculturation. Despite the important contributions of these models, we are left with a number of unanswered questions. Namely, what process determines who is or is not White or Black and why does the norm persist? In the language of Akerlof and Kranton, what determines the social categories and the prescriptive behavior assigned to these categories? If discrimination is a major source of racial inequality, then why does discrimination arise and persist? If "cultural" differences rather than discrimination cause racial inequality, then why does the market fail to equalize cultural differences? Is there a mainstream identity that is separable from each particular racial identity? What is the relationship between racial discrimination in the market and White identity?

## 5. Model

Consider a large population of agents divided into two groups, "Africans" and "Europeans." This division is fixed and exogenous. Africans cannot become Europeans, and Europeans cannot become Africans. Assume there is a distribution of skin colors among each group; the modal Africans are dark phenotype persons who are easily identifiable relative to modal Europeans, who are light phenotype persons, but the distributions of phenotype overlap sufficiently to appear as a single bimodal distribution of phenotype. The populations of Africans and Europeans will be held fixed. Although the model will be applied to

Table 1
Normal form: racial identity game

| | European racialist (White) | European individualist | African racialist (Black) | African individualist |
|---|---|---|---|---|
| European racialist (White) | $\theta^{w} - \pi^{w}$ | $-\pi^{w}$ | $-\gamma^{w}\lambda^{w}$ | $\delta^{w}$ |
| European individualist | $\alpha^{w}\theta^{w}$ | 0 | $-\lambda^{w}$ | 0 |
| African racialist (Black) | $-\gamma^{b}\lambda^{b}$ | $\delta^{b}$ | $\theta^{b} - \pi^{b}$ | $-\pi^{b}$ |
| African individualist | $-\lambda^{b}$ | 0 | $\alpha^{b}\theta^{b}$ | 0 |

time intervals much longer than a generation, births and deaths will be ignored, as if people either lived forever or else perfectly replaced themselves through births and deaths behind the scenes. Analytically, the critical features of the African–European categorization are exogeneity and permanence. Other interpretations of the two categories might be entertained, such as "natives" and "immigrants," as long as exogeneity and permanence hold, at least approximately. However, we will stick to the labels "Europeans" and "Africans."

In each time period, matched pairs of agents (of equal ability) randomly interact to produce a market or non-market product. Own-group interaction occurs with probability $\varepsilon$ and other-group interaction occurs with probability $1 - \varepsilon$. Agents' productivity in this interaction depends on the mutual compatibility of their identities. "Racialist" agents are altruistic toward own-group members, but antagonistic toward other-group members. "Individualists" are neutral in social interactions, neither altruistic nor antagonistic toward other agents in social interactions. Europeans who employ a racialist strategy are referred to as "Whites," while Africans who employ a racialist strategy are referred to as "Blacks."

Agents cooperate and compete over a range of socioeconomic activities, for example, employment, advanced education, housing, credit, mating opportunities, religious, political and other institutional leadership positions, and so forth. Persons interact on the basis of their individual abilities as well as group resources that may be drawn upon to enhance their productive potential. In particular, agents engage in social interactions with resources that are provided to (or withheld from) them by their families, other nurturing groups, and those who support a particular identity action.

Agents' payoffs from the social interaction are presented in Table 1, where the payoffs represent changes in an agent's productivity. There are four population categories; hence, a typical pairwise meeting is between an agent fitting one of four types and another agent conforming to one of four types, resulting in a $4 \times 4$ table. For a given cell, the entry is the payoff to the row-player from a meeting with the column-player. The payoff to the column-player from such a meeting is the symmetrically opposite cell. For example, using letters to abbreviate cells, suppose an EI person meets a Black person. The payoff to the EI person $\{-\lambda^{w}\}$ is in cell (EI, AR), and the payoff to the Black person $\{\delta^{b}\}$ is in its symmetric opposite, the (AR, EI) cell. Put differently, the matrix of column-player payoffs is the transpose of the matrix given. The joint payoffs of agents represent the total output associated with particular identity configurations.[4]

Payoffs can be explained by interpreting the Greek parameters and seeing how and where they appear in the table. Consider within-group parameters first. They describe payoffs when

[4] For an anthropological model closely related to the model we develop below, see McElreath et al. (in press).

Europeans pair with Europeans or Africans pair with Africans. Thus, they appear in the upper left and lower right $2 \times 2$ blocks of the table. Consider the upper left $2 \times 2$ (European-with-European matches). $\theta^{w} \geq 0$ represents the benefit that European racialism confers on Whites. It might be thought of as the "European-to-European altruism" parameter. $\pi^{w} \geq 0$ represents the cost that Whites pay for embracing European racialism. European individualists do not actively embrace racialism and, therefore, do not pay this cost. However, their European-to-European benefit is discounted by a factor $\alpha^{w}$ as a consequence of their lack of racial identity. $\alpha^{w} = 1$ for racialists, but $0 \leq \alpha^{w} \leq 1$ for individualists. $\alpha^{w}$ may be referred to as the "free-rider coefficient." The lower right $2 \times 2$, involving the parameters $\theta^{b}$, $\pi^{b}$, and $\alpha^{b}$, has a similar interpretation, but for Africans.

Next consider between-group payoff parameters. They describe payoffs when Africans pair with Europeans. Thus, they appear in the upper right and lower left $2 \times 2$ blocks of the table.

$\delta^{b} \geq 0$ represents the benefit that African racialism confers on Blacks paired with European individualists. It might be thought as the Black-to-European individualist antagonism benefit parameter. $\lambda^{b} \geq 0$ represents the reduction in productivity that African individuals pay when they are paired with Whites. It might be thought of the "African individualist-to-White cost of antagonism." Blacks do not face White antagonism alone; accordingly, the cost of White antagonism is discounted by a factor $\gamma^{b}$. $\gamma^{b} = 1$ for individualists, but $0 \leq \gamma^{b} \leq 1$ for racialists. $\gamma^{b}$ may be referred to the "oppression coefficient." The upper right $2 \times 2$, involving the parameters $\delta^{b}$, $\lambda^{b}$, and $\gamma^{b}$, has a similar interpretation, but for Europeans.

For intuition, consider some extreme cases of matching. If matching were only within groups, Africans with Africans and Europeans with Europeans, then only the upper left $2 \times 2$ would matter for Europeans, and only the lower right $2 \times 2$ would matter for Africans. Inspection shows that if $\theta^{w} - \pi^{w} > \alpha^{w}\theta^{w}$, the upper left $2 \times 2$ defines a coordination game among Whites. Likewise, if $\theta^{b} - \pi^{b} > \alpha^{b}\theta^{b}$, the lower right $2 \times 2$ defines a coordination game among Blacks. Thus, in this extreme case, depending on initial conditions, we might expect Europeans to adapt to either complete racialism or complete individualism, and similarly for Africans.

As a different extreme case, suppose matching were only between groups, Europeans matching only with Africans, and vice versa. Then, only the upper right and lower left $2 \times 2$ blocks would matter. Inspection shows that they define a prisoner's dilemma. Racialism dominates for both Europeans and Africans, even though each group would be better off if its members could somehow agree to adhere to individualism.

As these extreme cases suggest, there are forces in the model that might push either group toward racialism or toward individualism, depending on matching assumptions, dynamic assumptions, parameter values, and initial conditions.

There are four types of persons. Since their population shares sum to one, we would normally expect three degrees of freedom in the evolutionary dynamic. In this model, however, the population mix between Whites and Blacks is fixed, reducing the degrees of freedom to two. Thus, the dynamic can be described by two equations, one for European racialist share (fraction of Whites) and for the African racialist share (fraction of Blacks). If agents earn a high payoff in their game, their wealth increases. Wealthy persons are imitated by less successful persons of their group; for example, wealthy European individualists are imitated by Whites who then become European individualists.

Let $k$ represent the social group index (African and European) and $k^+$ represent the opposing social group. Changes in the benefits of racialism ($\alpha$, $\delta$, $\gamma$), the cost of altruism ($\pi$), and the cost of racial antagonism ($\lambda$) will alter the fraction of racialists and individualists ($\mu^k$, $1-\mu^k$) within social groups and alter the distribution of income between groups ($w^k$, $w^{k+}$). But each of the payoff parameters ($\alpha$, $\delta$, $\gamma$, $\theta$, $\pi$, $\lambda$) is most certainly affected by the distribution of wealth.

Further, at a minimum, the extent of integration, the fraction of own-group pairwise matchings ($\varepsilon$), will be affected by relative population density and the relative intensity of racialism within a social group.[5] Assume that Europeans persons are 85 percent of society while Africans are 15 percent. In a fully integrated society, each agent would have a 0.85 probability of interacting with a European and a 0.15 probability of interacting with an African. In a fully segregated society, each individual interacts with members of her/his own group with probability 1. The presence of racialist identities lowers the probability of other-group interactions. A linear expression of this relationship is

$$\varepsilon^k = \left(\frac{N^k}{N}\right) + \left(\frac{1-N^k}{N}\right)\mu^k, \tag{1}$$

where $N$ is the total population (all Africans + all Europeans) and $N^k$ is group $k$'s population size; hence, $N^{\text{Africans}}/N$ is the fraction of Africans in the population and $N^{\text{Europeans}}/N$ is the fraction of Europeans in the population.

According to the expected payoffs shown below, the fitness of each strategy depends on both the fraction of own-group agents playing a racialist strategy and the fraction of other-group agents playing a racialist strategy. Mean group fitness is a weighted combination of the individualist and racialist strategies.

The agent's expected payoff for playing a racialist strategy is

$$\begin{aligned} w^{k\text{R}} &= (1-\varepsilon)E(\text{Racialist}|\text{Between}) + \varepsilon E(\text{Racialist}|\text{Within}) \\ &= (1-\varepsilon)[-\mu^{k+}\gamma^k\lambda^k + (1-\mu^{k+})\delta^k] + \varepsilon[\mu^k(\theta^k-\pi^k) - (1-\mu^k)\pi^k], \end{aligned} \tag{2}$$

where $E(\cdot)$ is the expected value operator.

The agent's expected payoff for playing an individualist strategy is

$$\begin{aligned} w^{k\text{I}} &= (1-\varepsilon^k)E(\text{Individualist}|\text{Between}) + \varepsilon^k E(\text{Individualist}|\text{Within}) \\ &= -(1-\varepsilon^k)\mu^{k+}\lambda^k + \varepsilon^k\mu^k\alpha^k\theta^k. \end{aligned} \tag{3}$$

[5] We are ignoring here the direct impact of racialism and segregation on productivity. Person $i$ of Europeans and Person $j$ of Africans compete for employment at a particular firm. The job requires individual of skill level $X$ and a high degree of interaction with colleagues. The nature and extent of interaction with colleagues affects a worker's ability to translate skill ($X$) into productivity ($P$). Because $P = P(X, \varepsilon, \mu)$, the probability of an individual receiving a job offer (or promotion, or access to advanced training or access to occupation ladder with the highest wage or status potential) depends on the individual's skill set and her/his identity. The optimal identity for the job might be described by an action profile $A^k = \{$spouse, religious affiliation, residential location, social club membership, informal language usage, mannerism, dress style, recreational activities, artistic and entertainment preferences, political ideology, afterwork activities$\}$. Note that none of these identity activities are directly productive, but collectively they convey information regarding which employee will be the "best fit" for the job.

The group's expected fitness is

$$\begin{aligned} w^k &= \mu^k w^{k\mathrm{R}} + (1-\mu^k) w^{k\mathrm{I}} \\ &= \mu^k(1-\varepsilon^k)[(1-\mu^{k+})\delta^k - \mu^{k+}\gamma^k\lambda^k] \\ &\quad + \varepsilon^k\{\mu^k(\mu^k\theta^k - \pi^k) + (1-\mu^k)(\mu^{k+}\lambda^k + \mu^k\alpha^k\theta^k)\} - (1-\mu^k)\mu^{k+}\lambda^k. \end{aligned} \tag{4}$$

The replicator dynamic (5) determines the growth rate of racialism ($\hat{\mu}$): it shows that a strategy's growth rate varies directly with the strategy's expected rate of return:

$$\begin{aligned} \hat{u}^{k\mathrm{R}} &= \mu^k(w^{k\mathrm{R}} - w^k) \\ &= \mu^k(1-\mu^k)\{(1-\varepsilon^k)[(1-\mu^{k+})\delta^k + (1-\gamma^k)\mu^{k+}\lambda^k] \\ &\quad + \varepsilon^k[(1-\alpha^k)\mu^k\theta^k - \pi^k]\}. \end{aligned} \tag{5}$$

The replicator dynamic suggests that if a group has an identity singularity (for example, if all persons are individualists), there are no incentives for the identity structure of that group to change over time. Pure populations reproduce pure populations; if there are no players of a particular strategy, then that strategy will remain dormant during future periods. The growth rate of racialism is determined by a weighted average of the between and within-group effects.

Note that the between-group effect is non-negative: $(1-\varepsilon^k)[(1-\mu^{k+})\delta^k + \mu^{k+}(1-\gamma^k)\lambda^k] \geq 0$. Thus, changes in the parameters of the between-group effect may raise or lower the speed of increase in the growth of racialism, but the between-group effect will always have a non-negative impact on the growth of racialists. The within-group effect, $\varepsilon^k[(1-\alpha^k)\mu^k\theta^k - \pi^k]$, may be negative if the cost of racial altruism is sufficiently large, that is, $\pi^k > (1-\alpha^k)\mu^k\theta^k$. Note that $0 \leq (1-\alpha^k)\mu^k\theta^k \leq (1-\alpha^k)\theta^k$ since $\mu^k \in (0, 1)$. If the cost of altruism is not sufficiently large, the non-negative within- and between-group effects will likely ensure that racialists are (at a minimum) a positive and non-decreasing fraction of the economy. Hence, the crucial factor determining the equilibrium distribution of identity is whether the cost of altruism is sufficiently large.

### *5.1. Individualist economy ($\mu^b \to 0$ and $\mu^w \to 0$)*

Complete individualism will emerge as a social norm if and only if both within-group effects are negative and dominate the respective between-group effect. For Africans, we must have $\varepsilon^{\mathrm{b}}[(1-\alpha^{\mathrm{b}})\mu^{\mathrm{b}}\theta^{\mathrm{b}} - \pi^{\mathrm{b}}] < 0$ and $|\varepsilon^{\mathrm{b}}[(1-\alpha^{\mathrm{b}})\mu^{\mathrm{b}}\theta^{\mathrm{b}} - \pi^{\mathrm{b}}]| > (1-\varepsilon^{\mathrm{b}})[(1-\mu^{\mathrm{w}})\delta^{\mathrm{b}} + \mu^{\mathrm{w}}(1-\gamma^{\mathrm{b}})\lambda^{\mathrm{b}}]$. Simultaneously, for Europeans, we must have $\varepsilon^{\mathrm{w}}[(1-\alpha^{\mathrm{w}})\mu^{\mathrm{w}}\theta^{\mathrm{w}} - \pi^{\mathrm{w}}] < 0$ and $|\varepsilon^{\mathrm{w}}[(1-\alpha^{\mathrm{w}})\mu^{\mathrm{w}}\theta^{\mathrm{w}} - \pi^{\mathrm{w}}]| > (1-\varepsilon^{\mathrm{w}})[(1-\mu^{\mathrm{b}})\delta^{\mathrm{w}} + \mu^{\mathrm{b}}(1-\gamma^{\mathrm{w}})\lambda^{\mathrm{w}}]$. A negative within-group effect implies the breakdown of altruism among the affected group. However, for minority sub-groups, the between-group effect will likely dominate the within-group effect while the opposite holds true when a sub-group is a numerical majority. For example, for African Americans, $\varepsilon \approx 0.13$, while $\varepsilon \approx 0.80$ for Americans of European descent. Hence, the development of an African individualist norm is largely determined by inter-group antagonism while the development of European individualism is largely determined by intra-group altruism.

The dynamic properties of the model appear to correspond to available evidence regarding factors affecting the intensity of racial identification and differences in perceptions of causes of persisting racial economic disparities. Notably, although the 2000 decennial census of the USA allowed individuals to choose one or more racial categories, about 98 percent of European Americans self-identity solely as White while a similar percentage of African Americans solely identity as Black. In a study conducted in 1995 and 1996, Sanders Thompson (1999) found that primarily socialization processes and networks within African American communities determined the importance of racial identity among Blacks. In her sample, experiences with integration and discrimination were not strongly related to the intensity of racial identification. Sanders Thompson also found that the intensity of racial identification influenced political attitudes and behaviors.

Evidence from the General Social Survey indicates that Blacks and Whites differ in their perceptions of the sources of the inter-racial disparity in wealth holdings.[6] Between 1985 and 1994, the proportion of Blacks attributing inter-racial disparities in jobs, income, and housing mainly to discrimination has ranged between 70 and 80 percent. That proportion has generally been increasing over time. In contrast, about 30 percent of Whites attributed the disparities to discrimination in 1994, compared to 35 percent in 1985. Approximately 50 percent of Whites cited lack of motivation to get out of poverty as the principal explanation for the disparities in 1994, a decline from levels reported in the early 1990s, but well above the 30 percent figure for Blacks, which declined sharply from 45 percent in 1991. These perceptual differences may be explained by the relative importance of between- and within-group interactions.

### 5.2. *Racialist economy ($\mu^b \to 1$ and $\mu^w \to 1$)*

Universal racialism will emerge as a social norm if either of two conditions holds. First, racialism will emerge as a social norm if cost of altruism is not sufficiently large for each group. That is to say, universal racialism will emerge as a social norm if $\varepsilon^{\mathrm{b}}[(1-\alpha^{\mathrm{b}})\mu^{\mathrm{b}}\theta^{\mathrm{b}}-\pi^{\mathrm{b}}]>0$ and $\varepsilon^{\mathrm{w}}[(1-\alpha^{\mathrm{w}})\mu^{\mathrm{w}}\theta^{\mathrm{w}}-\pi^{\mathrm{w}}]>0$. Second, complete racialism may also emerge as a social norm when the cost of altruism is sufficiently large (for each group) but the within-group effect is dominated by the between-group effect (for each group). In this case, for Africans, we have $\varepsilon^{\mathrm{b}}[(1-\alpha^{\mathrm{b}})\mu^{\mathrm{b}}\theta^{\mathrm{b}}-\pi^{\mathrm{b}}]<0$ and $|\varepsilon^{\mathrm{b}}[(1-\alpha^{\mathrm{b}})\mu^{\mathrm{b}}\theta^{\mathrm{b}}-\pi^{\mathrm{b}}]|<(1-\varepsilon^{\mathrm{b}})[(1-\mu^{\mathrm{w}})\delta^{\mathrm{b}}+\mu^{\mathrm{w}}(1-\gamma^{\mathrm{b}})\lambda^{\mathrm{b}}]$. Simultaneously, for Europeans, we have $\varepsilon^{\mathrm{w}}[(1-\alpha^{\mathrm{w}})\mu^{\mathrm{w}}\theta^{\mathrm{w}}-\pi^{\mathrm{w}}]<0$ and $|\varepsilon^{\mathrm{w}}[(1-\alpha^{\mathrm{w}})\mu^{\mathrm{w}}\theta^{\mathrm{w}}-\pi^{\mathrm{w}}]|<(1-\varepsilon^{\mathrm{w}})[(1-\mu^{\mathrm{b}})\delta^{\mathrm{w}}+\mu^{\mathrm{b}}(1-\gamma^{\mathrm{w}})\lambda^{\mathrm{w}}]$.

### 5.3. *Mixed identity economy ($0<\mu^b<1$, $\hat{\mu}^b=0$ and/or $0<\mu^w<1$, $\hat{\mu}^w=0$)*

Several conditions may produce an interior solution, that is, an economy where at least one social group is characterized by dual social norms. If an interior solution exists for Africans, then we will observe both Blacks and individualists. If an interior solution exists for Europeans, then we will observe both Whites and individualists. All interior solutions

[6] See Center for New Black Leadership, http://www.cnbl.org/html/racial.html, September 18, 2000.

imply that the cost of racial altruism is sufficiently large to outweigh the expected benefit of racial altruism and that the expected value of the within-group effect is just equal to the expected value of the between-group effect at some $0 < \mu^k < 1$.

First, dual social norms may occur when (for at least one group) $\varepsilon^k[(1-\alpha^k)\mu^k\theta^k - \pi^k] < 0$ and $|\varepsilon^k[(1-\alpha^k)\mu^k\theta^k - \pi^k]| = (1-\varepsilon^k)[(1-\mu^{k+})\delta^k + \mu^{k+}(1-\gamma^k)\lambda^k]$.

Second, dual social norms may occur when at least one group's between- and within-group effects are simultaneously equal to zero.

(a) This occurs when for at least one group we have $\varepsilon^k[(1-\alpha^k)\mu^k\theta^k - \pi^k] = 0$ and $\delta^k = \lambda^k = 0$.
(b) Dual social norms also occur for at least one group if we have $\varepsilon^k[(1-\alpha^k)\mu^k\theta^k - \pi^k] = 0$ and $\delta^k = 0$ and $\gamma^k = 1$.

Each of these equalities may well hold as special cases, especially when a sub-group is a relatively small fraction of the total population and when a sub-group is not easily distinguished the larger population. None of the mixed identity equilibrium payoffs is likely to hold as a general case unless there is an egalitarian distribution of wealth. Even if this equality were to hold during a given time period, it would change to an inequality within a generation if there were differential birth, death, immigration, or emigration rates (since these differentials will alter $\varepsilon$). In the absence of equality of rates of return, the distribution of identity will exhibit decreasing variation. If $\hat{\mu}^k \neq 0$, then the distribution of identity among group $k$ will move toward a singularity as either racialists or individualists gradually disappear from group $k$.

### *5.4. Wealth and payoff parameters*

Our quest in this paper has been to isolate the factors that contribute to the formation of differing racial identities among otherwise identical persons. Hence, it has simplified our analysis to assume that all persons, whether African or European, have identical individual characteristics such as education, years of labor market experience, ability, and so forth. Thus, differences in the productivity of social interactions are not due to differences in the productive ability of individuals per se. Assume, for example, that prior to all initial inter-group pairwise meetings, "nature" (some suitably exogenous set of forces) has allowed each European to accumulate identical, positive, and substantial financial wealth but each African has zero financial wealth. The force of this assumption is to allow inter-group differences in the endogenous dimension of race to change in response to factors other than differences in the relative size of the two population groups. Greater relative wealth increases the gain from altruism ($\theta$) and the antagonism benefit ($\delta$), while lowering the oppression coefficient ($\gamma$). Also, greater relative wealth decreases the free-rider coefficient ($\alpha$), cost of altruism ($\pi$), and the cost of antagonism ($\lambda$).

The formation of social identity norms may interact with prior differences in financial wealth to reproduce multiple identity–wealth configurations: individualist social norm with decreasing wealth inequality, racialist social norm with increasing wealth inequality, dual identity norms with increasing, decreasing, or unchanged wealth inequality. Of course, the American experience with slavery and Jim Crow and the South African experience with apartheid is evidence that state policy may also have a dramatic impact on the formation

of identity norms and inter-group financial wealth inequality. Unfortunately, precise statistical information on the impact of state policy and financial wealth on the model's payoff parameters is not available, and formal expressions of these relationships are beyond the scope of this paper.

## 6. Implications for social construction of racial identity

Without invoking any claims of exclusivity or definitiveness, the characteristics of the equilibria of this model lend significant insight into multiple social issues. Although we do not wish to make empirical claims, the model of racial identity formation provides a framework for understanding social phenomena such as racial labeling, acculturation, and other important policies and processes. Consider, for example, self-identification and labeling conventions that are present in so-called multiracial countries. The framework developed here suggests that labeling conventions emerge to distinguish social groups if a stable racialist or mixed identity norm exists. To the extent that a racialist or mixed identity social norm is resistant to mutations, a racial descriptor must readily establish the mutually exclusive racial group membership of all persons. Further, it is likely that the binary descriptor will be fashioned to limit entry into the wealthiest social group. When racialized identities exist as a social norm, an obvious candidate for the descriptive rule is "All persons with light skin color are White; otherwise, the person is non-White, for example, Black" Over time, this binary descriptor would make "European" synonymous with "White" and "African" synonymous with "Black." (See Higginbotham (1978) for a detailed historico-legal account of the formation of racial identities in early 17th century Virginia.)

Racial descriptors permit access to intra-group altruism while also identifying individuals for other-group antagonism. Parents must decide whether they will socialize children to accept or reject the racial identity system. Accepting or rejecting the racial identity system affects the payoffs that children will receive when they interact with members of their own and other groups. When a racialist or mixed identity norm exists, it is in the best interest of each parent to raise their offspring to accept the binary descriptor. If the majority of other-group parents raise their children to accept the binary descriptor, then it is in the best interest of all own-group parents to raise their children to accept the binary descriptor. McGuire et al. (1978) and Ramsey and Myers (1990) observed that children take notice of their race or ethnicity more spontaneously when their group is in the minority. Semons (1991) reported that the significance of racial identity to Black and White adolescents increased when they were in the presence of peers of the other racial group and that both groups were cognizant of the history of inter-group conflict between Blacks and Whites.

When a racialist identity or mixed identity equilibrium exists, acculturation is a social mutation. Historically, "passing" and "Tomming" have been important forms of acculturation within American society. In our model (and in actual societies with large numbers of both Europeans and Africans), some non-trivial fraction of Africans is indistinguishable from Europeans. Similarly, some non-trivial fraction of Europeans is indistinguishable from Africans. Some of these persons may play a "passing" strategy, that is, self-select an identity that violates the racial descriptor (if an individualist equilibrium does not exist). "Passing"

may be said to occur when European-featured Africans become White or when African-featured Europeans become Black. If passing occurs in large numbers, it is a mutation that might destabilize the identity norms of a racialized economy. Persons might wish to pass in order to arbitrage differences in fitness associated with racial identities.[7] If the mean wealth of Europeans exceeds the mean wealth of Africans by a substantial factor, there will be strong incentives for European-featured Africans to identity as White and relatively no incentive for African-featured Europeans to identify as Black. In the former case, there will be substantial penalties for exposure, namely re-segregation into Black society.

There are some historical facts on passing in America that are consistent with the framework of our model. First, few Europeans have sought to pass as Black. Anecdotal evidence suggests that when Europeans do pass and are found out, they do not pay a wealth penalty. On the other hand, Africans passing as White was a relatively more common phenomenon in American society. Africans who passed as White went to extreme lengths to make sure that they are never found out (Graham, 1999).

When a racialist or mixed identity norm exists, "Tomming" may be defined as ideological passing for those who lack the appropriate physical features to pass. Tomming then is also a mutate strategy. Nothing in our model limits this mutation to a particular group, but if economic motives are the primary reasons for Tomming, we should expect to see a greater presence among the least wealthy social group. Hence, one indication of our model is that African Toms are not permitted to pass as White, but they are permitted to pass as individuals among Whites if they are sufficiently ideologically integrated into Whiteness.

Is it possible for a racialized economy to emerge in the model from a society of equally wealthy groups? Yes. With equally wealthy groups we would have identical payoffs to each agent in a social interaction. None of the equilibrium conditions for racialist and mixed identity economies are inconsistent with equal payoffs for Africans and Europeans.

Consider now the reparations movement, which has begun to enjoy considerable discussion in the popular press. There are multiple reparations schema, but the common element involves some sort of wealth transfer from Americans of European descent to Americans of African descent. Our model is much too abstract to provide a detailed analysis of the implications of this movement for racial identity construction, but it does provide an important cautionary note. A reparations strategy alone, even if sufficient to equalize wealth across social groups, is not likely to be a sufficient strategy for pushing an economy out of a racialized equilibrium.

But suppose "nature" generates a change in the payoffs of social interactions such that $\theta = \lambda = \alpha = \delta = \gamma = 0$ for both Europeans and Africans. Call this an equal opportunity payoff structure. An individualist identity equilibrium will emerge if this payoff structure is permanent. A permanent equal opportunity structure is consistent with an egalitarian distribution of wealth. As such, our model does imply that if the reparations scheme is combined with state action to create equal opportunity, it may be possible to move the economy from a racialized equilibrium to a stable individualist equilibrium.

A temporary transition to an equal opportunity economy locks in existing inequalities and the existing pattern in racial segmentation in perpetuity. The existing inequalities of the

[7] Strictly speaking, we do not need differences in fitness for passing to occur. Individuals may choose to pass simply because they do not wish to accept the labels attached to them by society.

racialist past and the equal opportunities of the individualist present will be in conflict. Consider the social and economic commentary by intellectuals such as Loury (1989), Patterson (1997), Kennedy (1997), and Sleeper (1997), LPKS hereafter. They suggest that people of African American descent should take pride in their accomplishments as the result of individual effort and ability, not group solidarity. Consider the words of Kennedy (p. 56):

> I eschew racial pride because of my conception of what should properly be the object of pride for an individual: something that he or she has accomplished. I can feel pride in a good deed I have done or a good effort I have made. I cannot feel pride in some state of affairs that is independent of my contribution to it. The color of my skin, the width of my nose, the texture of my hair, and the various other signs that prompt people to label me Black constitute such a state of affairs. I did not achieve my racial designation. It was something I inherited – like my nationality and socio-economic starting place and sex – and therefore I should not feel proud or be credited with. In taking this position I follow Frederick Douglass, the great nineteenth-century reformer, who declared that "the only excuse for pride in individuals . . . is in the fact of their own achievements." If the sun has created curled hair and tanned skin, Douglass observed, "let the sun be proud of its achievement."

Suppose the LPKS perspective inspires a temporary social movement for individualism within an economy that has been in racialized equilibrium for decades. Despite material incentives for agents to pursue a racialist strategy, the LPKS inspired social movement causes individualism to increase (and racialist identification to decline) among both Europeans and Africans. This social movement would achieve some success in pushing the economy toward an individualist equilibrium; yet, after the social movement lost momentum, an expansion in segregation and racialized identities among Africans and among Europeans would be consistent with our model. As an ideological movement that does not seek to address inequalities in wealth and the absence of an equal opportunity payoff structure, the LPKS inspired social movement is not likely to undermine permanently either a racialist or mixed identity equilibrium.

## 7. Summary and discussion of results

We have presented and discussed an evolutionary game model of the formation of racial identity. The construction of racial identity is the result of both intra- and inter-group interactions. Starting with a fixed population of persons who are easily identified according to an exogenous criterion, for example, phenotype, we then allow individuals to pursue either a racialist or an individualist strategy in social interactions. Both market and non-market social interactions are productive. Individualists attempt to live as though they are race-free, even though their "phenotype" is in fact observable and has consequences. Racialists are altruistic toward their own social group but antagonistic toward other-group persons. Alternative social norms may form from the random interaction of agents, with each agent staying with or changing to the strategy with above average fitness. Fitness in this model is measured by the impact of racial identity on "income," that is, the productivity of social interactions.

One type of equilibrium in this model is an individualist social norm, where all persons pursue an individualist identity strategy; hence, race is insignificant for both market and non-market social interactions. A second type of equilibrium is a racialist social norm, where all persons pursue a racialist identity strategy; hence, race is significant for both market and non-market social interactions. Finally, we also explore the requirements for the existence of a mixed identity strategy equilibrium, where both individualist and racialist strategies are a persistent element of social interactions.

We find that the mixed identity economy is a special case that the economy is unlikely to move to under a regime of laissez faire social interactions.

This model differs significantly from the theories of discrimination that are encountered in the traditional economics literature. Theories of discrimination take racial identity as a given; they do not bother to explore the productivity of racial identity in social interactions. Moreover, except for a limited class of models based on non-neoclassical theories of competition, discrimination theories tend to be constructed around notions of prejudice (insufficient or incorrect information) and bigotry (inexplicable personal distaste) rather than racism (transformation of ascriptive characteristics into productive property). By connecting the formation of racial identity with the productivity of social interactions, this paper is able to explain the persistence of racial privilege in a market economy. The formation and persistence of a racialized economy simultaneously reproduce wealth inequality; that is, one racial group has racial privilege in exercising control over both public and private resources while members of other groups do not have such power. Hence, there is a relationship of domination and subordination underlying the dynamics we have presented in this paper. Thus, the intensity of racial identity, as well as the incentives for racial conflict, is very much related to the large inequities in material resources that are everywhere present in American society.

Our model of racial identification formation is a "secular" theory that explains the construction of racial identity, while discrimination models represent "cyclical" or short run changes in racial inequality when racial identity is given. The model can be extended in several directions. First, an obvious empirical question is what the impact of intra-group inequality on the distribution of identity is. This innovation would yield a model with dual norms, for example, an intra-group status norm and an inter-group race norm. Alternatively, we might explore what happens if there are conflicting conventions. For example, what type of identity equilibria will emerge if we allow individuals to vary according to a binary color descriptor as well as a binary gender descriptor?

Finally, future development of the model should expand the number of interacting groups. The opinion data cited previously suggest that the current regime is characterized by an increasing fraction of agents employing a racialist strategy. At the same time, there are various types of "mutations" inhibiting an equilibrium outcome. These include various separatist movements among Blacks, Whites, Native Americans, and others. There is also a growing multicultural movement that rejects the tenets of a racialist equilibrium and attempts to promote equal respect for all racial/ethnic groups, and there are also additional groups for which a racialist identity strategy may become attractive including various Latino and Asian populations as well as individuals claiming multiple racial/ethnic identities.

The increasingly complicated complex of distinctive phenotypic characteristics and unique cultural attributes will pose increasingly difficult challenges for public policy.

However, the transformation of these attributes into economic property and competing racial identities is not a law of nature.

## Appendix A

Derivations of fitness equations are presented below:

$$
\begin{aligned}
w^k &= \mu^k w^{k\mathrm{R}} + (1-\mu^k) w^{k\mathrm{I}} \\
&= \mu^k\{(1-\varepsilon)[-\mu^{k+}\gamma^k\lambda^k + (1-\mu^{k+})\delta^k] + \varepsilon[\mu^k(\theta^k-\pi^k) - (1-\mu^k)\pi^k]\} \\
&\quad + (1-\mu^k)\{-(1-\varepsilon)\mu^{k+}\lambda^k + \varepsilon\mu^k\alpha^k\theta^k\} \\
&= \mu^k(1-\varepsilon)[(1-\mu^{k+})\delta^k - \mu^{k+}\gamma^k\lambda^k] \\
&\quad + \varepsilon\{\mu^k(\mu^k\theta^k-\pi^k) + (1-\mu^k)(\mu^{k+}\lambda^k + \mu^k\alpha^k\theta^k)\} - (1-\mu^k)\mu^{k+}\lambda^k,
\end{aligned}
$$

$$
\begin{aligned}
\hat{u}^{k\mathrm{R}} &= \mu^k(w^{k\mathrm{R}} - w^k) \\
&= \mu^k\{(1-\varepsilon)[-\mu^{k+}\gamma^k\lambda^k + (1-\mu^{k+})\delta^k] + \varepsilon[\mu^k(\theta^k-\pi^k) - (1-\mu^k)\pi^k] \\
&\quad - \mu^k(1-\varepsilon)[(1-\mu^{k+})\delta^k - \mu^{k+}\gamma^k\lambda^k] \\
&\quad - \varepsilon[\mu^k(\mu^k\theta^k-\pi^k) + (1-\mu^k)(\mu^{k+}\lambda^k + \mu^k\alpha^k\theta^k)] + (1-\mu^k)\mu^{k+}\lambda^k\} \\
&= \mu^k\{(1-\varepsilon)[(1-\mu^{k+})\delta^k - \mu^{k+}\gamma^k\lambda^k] - \mu^k(1-\varepsilon)[(1-\mu^{k+})\delta^k - \mu^{k+}\gamma^k\lambda^k] \\
&\quad + \varepsilon[\mu^k(\theta^k-\pi^k) - (1-\mu^k)\pi^k] \\
&\quad - \varepsilon[\mu^k(\mu^k\theta^k-\pi^k) + (1-\mu^k)(\mu^{k+}\lambda^k + \mu^k\alpha^k\theta^k)] + (1-\mu^k)\mu^{k+}\lambda^k\} \\
&= \mu^k(1-\mu^k)\{(1-\varepsilon)[(1-\mu^{k+})\delta^k - \mu^{k+}\gamma^k\lambda^k] \\
&\quad + \varepsilon[(1-\alpha^k)\mu^k\theta^k - \pi^k - \mu^{k+}\lambda^k] + \mu^{k+}\lambda^k\} \\
&= \mu^k(1-\mu^k)\{(1-\varepsilon)[(1-\mu^{k+})\delta^k - \mu^{k+}\gamma^k\lambda^k] \\
&\quad + \varepsilon[(1-\alpha^k)\mu^k\theta^k - \pi^k] + \mu^{k+}\lambda^k - \varepsilon\mu^{k+}\lambda^k\} \\
&= \mu^k(1-\mu^k)\{(1-\varepsilon)[(1-\mu^{k+})\delta^k + (1-\gamma^k)\mu^{k+}\lambda^k] \\
&\quad + \varepsilon[(1-\alpha^k)\mu^k\theta^k - \pi^k]
\end{aligned}
$$

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