

Group Inequality, Endogenous Categorization
and Neighborhood Effects

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Abstract

The underlying hypothesis of this PhD dissertation is that the use of neighborhood effects as an instrument to combat group inequality is weakened by the endogeneity of the categorization. By endogeneity of categorization, I mean the influence of endogenous elements – as behavioral traits – in the sorting of individuals. If categorization is essentially endogenous, members of dominated groups adopting a pro-mobility behavior can be placed – either by themselves or by others – as members of the dominant group, what weakens their influence on the other members of the group. In the first paper of this dissertation, “Categorization Endogeneity and Group Inequality”, it is shown how this effect may arise using a social concept of neighborhood. In the model developed in this paper, endogeneity of categorization reduces the observed human capital accumulated in the dominated group, as some members of this category can be “expelled” from the group by playing idiosyncratically. Supposing neighborhood effects, it may lead to a real decline in the human capital level of the subaltern group. The second essay, “Endogenous Race and Intergenerational Educational Mobility”, deals specifically with racial categorization and relies on a physical sense of neighborhood. Here, it is shown how the endogeneity of racial categorization, by placing educated parents – regardless their phenotype – in the same neighborhood, may contribute to the persistence of educational inequality. Finally, the third paper, “Endogenous Categorization and Neighborhood Effects”, brings some empirical evidence of this hypothesis. Using Brazilian data, it compares two categorizations which naturally differ in their degrees of endogeneity: gender (a basically exogenous categorization) and race (a basically endogenous one). When the endogenous categorization is considered, the estimated neighborhood effects regarding a pro-mobility behavior (school attendance) for the dominated group (afro-descendants) are clearly weaker than those for the dominant group (whites). Such evidence disappears, however, when the exogenous

ABSTRACT

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categorization is taken into consideration.

Introduction

Nowadays, group inequality is a phenomenon that still can be observed throughout the world. It is present in a broad range of contexts: countries with both large populations (India, United States, Brazil, and Japan) and small populations (Belize, Trinidad and Tobago, Israel, and New Zealand); higher-income countries (Australia, Canada, Japan, and the United States), as well as in lower income countries (India, Belize, and South Africa); countries with high growth rates (Malaysia, Japan, Belize, and India), as well as in countries with low or negative growth rates (South Africa and New Zealand); and countries with high levels of general inequality (Brazil, South Africa, and Malaysia), as well as in countries with low levels of general inequality (Canada, India, Australia, and Israel) (Darity Jr. & Nembhard, 2000).

In order to combat group inequality, group-oriented policies (GOP) are frequently adopted at the local or national level. In general, such policies take the form of jobs and college quotas for members of historically discriminated groups. Notwithstanding, these policies in almost all cases involve a certain amount of social cost. It occurs, in general, because they are contested by deprived individuals which are not seen as members of some benefited group. In its highest level, this cost can appear in the form of violent group clashes. Examples are the British 2001 Summer of Violence Riots, which took place in May of that year in some British cities, and the conflicts between Gujjars and Meenas in India in June 2007.

Due to these costs, it is important to have an as accurate as possible measure of the efficiency of GOP. They entail a direct effect: college quotas, for instance, lead to an increase in the school enrolment of the benefited group. In addition, these policies also bring about indirect effects. Observing that some members of their group are enrolling school, other members of the benefited group are influenced to do the same. Such indirect effects can be called neighborhood

effects.

In fact, neighborhood effects can significantly amplify the effects of GOP, becoming an important component of their effectiveness. As summarized by this quotation from Durlauf (2004),

Neighborhood effects are also important as they may reinforce the effects of changes in private incentives. Suppose one is considering whether to provide college scholarships to randomly chosen students across a set of high schools versus concentrating the scholarships among students within a given school. If the objective of the program is to alter high school graduation rates, then the presence of social interactions can, other things equal, mean that the concentration of the scholarships will be more efficacious. Assuming the direct incentive effect of the scholarships is the same for students across schools, the advantage of concentrating the scholarships in one school is that they will induce neighborhood effects that affect all students in the school, including those who have not been offered scholarships (Durlauf, 2004: 2178).

However, the use of neighborhood effects as an instrument to combat group inequality is weakened by the endogeneity of the categorization. Throughout this dissertation, I mean by endogeneity of categorization the influence of behavioral traits in the sorting of individuals. Groups have behavioral prescriptions attached to them, understood as the ideal behavior of members of that category. The higher the degree of endogeneity of categorization, the more the categorization of an individual as a member of some group relies on the adherence of her behavior to the group's behavioral prescriptions.

Dominated groups, in general, have behavioral prescriptions which are incompatible with socio-economic mobility. Hence, if categorization is essentially endogenous, members of dominated groups adopting a pro-mobility behavior can be placed – either by themselves or by others – as members of the dominant group, what weakens their influence on the other members of the group.

The purpose of this dissertation is to provide theoretical and empirical support to the above-mentioned hypothesis. On the theoretical point of view, this dissertation deals with two possible concepts of neighborhood. The first one is the social neighborhood. This definition of neighborhood is not geographically delimited. One's neighbors – and, hence, those whose actions will influence one's behavior – are simply those one identifies with. It can be said, for instance, that

Nelson Mandela is a member of the social neighborhood of all those who sympathize with African culture around the world, and that the Dalai Lama integrates the social neighborhood of all Buddhists and/or those who are favorable to the independence of Tibet.

The first paper of this dissertation, “Categorization Endogeneity and Group Inequality”, relies on this concept of neighborhood. In the model presented in this paper, categorization endogeneity is set in the following way: self-categorization is exogenous, rooted in phenotypic characteristics, but categorization by others is endogenous, in such a way that members of the subaltern category may be seen by others as members of the dominant category if they choose to acquire education. From the market point of view, categorization endogeneity facilitates the acquisition of qualification by members of subaltern groups. In fact, if higher wages, access to education, better jobs etc are reserved to members of dominant groups, individuals coming from dominated groups would be better-off if they can pass as members of the dominant group by acquiring education.

From the sociological point of view, however, the effect is opposite. The *observed* human capital accumulated in the dominated group, which influences positively the individual decision of members of this group in acquiring education, is reduced by the endogeneity of categorization, as some members of this category can be “expelled” from the group by playing idiosyncratically. The paper concludes that, if discrimination is sufficiently small, categorization endogeneity is harmful to the human capital accumulation among members of dominated groups.

A second type of neighborhood – by the way, the most commonly observed in the literature – can be called physical neighborhood. In this case, physical proximity matters – neighbors are those who share some physical space, as a classroom or a residential area. This is the concept of neighborhood used in the second essay of this dissertation, “Endogenous Race and Intergenerational Educational Mobility”. It deals specifically with racial categorization and departs from an empirical puzzle: an extensive literature sustains that educational mobility of disadvantaged racial groups tend to be lower in racially segregated regions. However, it is not observed in two of the most notorious cases of racial inequality in the world, Brazil and South Africa.

In the model developed in this paper, it is shown how the endogeneity of racial categorization, by placing educated parents – regardless their phenotype – in the same neighborhood, may contribute to the persistence of educational

inequality.

Finally, the third paper, “Endogenous Categorization and Neighborhood Effects”, brings some empirical evidence of this hypothesis. Here, the idea of neighborhood encompasses the two concepts of neighborhood discussed before. Neighbors are those living in the same residential area and linked by some identity tie. Regarding this identity glue, two categorizations are considered: gender (a basically exogenous categorization) and race (a basically endogenous one).

Using data from the Metropolitan Region of São Paulo (Brazil), it estimates neighborhood effects regarding a pro-mobility behavior (school attendance) for four groups, established according to the two utilized categorizations: males, females, Whites and Afro-descendants. When the endogenous categorization is considered, the estimated neighborhood effects for the dominated group (Afro-descendants) are clearly weaker than those for the dominant group (whites). Such evidence disappears, however, when the exogenous categorization is taken into consideration.

After the presentation of the papers, an overall conclusion discusses the main findings of the three essays and their implications for public policies.

Chapter 1

Categorization Endogeneity and Group Inequality

Abstract: The objective of this paper is to integrate economic and sociological elements in a model of human capital accumulation by phenotypically distinct individuals. Both kinds of elements are influenced by the degree of categorization endogeneity (CE), meant as the influence of endogenous elements (e.g., behavioral traits) in group categorization. If CE is high, members of dominated groups can pass as members of dominant groups by adopting the behavioral norm associated with that group. CE facilitates group equality by decreasing the ability to discriminate between members of dominant and dominated groups, but it weakens intra-group neighborhood effects. It is argued that, under sufficiently low levels of discrimination, CE widens the range of values of educational cost for which group inequality is stable.

Key-words: human capital, neighborhood effects, categorization endogeneity.

JEL Classification: O15; Z13; C62.

1.1 Introduction

Group inequality is still a commonly observed phenomenon worldwide. It occurs in a broad range of contexts: countries with both large populations (India, United States, Brazil, and Japan) and small populations (Belize, Trinidad and Tobago, Israel, and New Zealand); higher-income countries (Australia, Canada,

Japan, and the United States), as well as in lower income countries (India, Belize, and South Africa); countries with high growth rates (Malaysia, Japan, Belize, and India), as well as in countries with low or negative growth rates (South Africa and New Zealand); and countries with high levels of general inequality (Brazil, South Africa, and Malaysia), as well as in countries with low levels of general inequality (Canada, India, Australia, and Israel) (Darity Jr. & Nembhard, 2000).

Traditional economic analysis has focused on two main explanations for the existence of group inequality. The first one is that members of discriminated groups enjoy smaller returns on human capital investment, due to taste-based (Becker, 1957) or occupational discrimination (e.g., Bergmann, 1974). In this case, two equally qualified individuals coming from different groups will receive different wages due to pure taste discrimination or because individuals coming from discriminated groups are confined to low-wage sectors.

The second explanation for group inequality is that members of discriminated groups accumulate less human capital than those coming from dominant groups. It can be explained, for instance, by statistical discrimination (Phelps, 1972, Arrow, 1973), discrimination in the access to and quality of schooling¹ or disadvantages accumulated over generations²

Economic elements alone are not able to fully explain group inequality. For instance, group discrimination is unprofitable to firms. Thus, competition would make discrimination in the labor market disappear in the long run (Arrow, 1973). However, pure taste discrimination is still observed. The usual explanation for this, statistical discrimination, is not satisfactory, as it relies on unrealistic postulates as the observation of individual's marginal productivity (Arrow, 1998). This quotation from Arrow (1998) summarizes this view:

I am going to suggest in this paper that market-based explanations will tend to predict that racial discrimination will be eliminated. Since they are not, we must seek elsewhere for non-market factors influencing economic behavior. The concepts of direct *social interaction* and networks seem to be good places to start (Arrow, 1998: 2, italics added).

In this vein, economists are more and more convinced that social elements should

¹It has as consequence not only smaller levels of education, but also smaller returns to education and earnings (Chiswick, 1988).

²Becker & Tomes (1986) discuss how families concerned about the welfare of their children can transmit them assets and earnings, stimulating their human capital accumulation.

be taken into account for the sake of a better understanding of group inequality. It is widely recognized that one's conditions and incentives to adopt a pro-mobility behavior depends on the characteristics of one's reference group, or neighborhood. For instance, the individual cost of acquiring education may be decreasing in the average effort in education in one's residential area (Brock & Durlauf, 2001). Groups defined along social rather than physical lines can also contribute to the persistence of group inequality. Exclusion may lead discriminated social categories, as Blacks in most Western countries, to adopt a detrimental behavior as behavioral prescriptions (Akerlof & Kranton, 2000).

Nonetheless, there is not a consensus among these sociological theories of group inequality regarding the role played by segregation on the persistence of group-based differences. The seminal study from Loury (1977) argues that racial inequality can persist due to racial segregation. This view is shared by other studies as Bowles et al (2007), Bowles & Sethi (2006), Chaudhuri & Sethi (2008) and Sethi & Somanathan (2004). The concern here is with inter-group neighborhood effects: segregation prevents members of dominated groups from enjoying positive externalities stemming from dominant groups.

Other sociological-based explanations for group inequality, however, argue that integration rather than segregation can contribute to the persistence of group inequality. The constitution of "oppositional identities" (Bisin et al, 2006), where the behavioral norms associated with the dominant group are rejected, can be stronger in mixed neighborhoods. For instance, Fryer & Torelli (2005) find that the punishment to "acting white" behaviors (e.g., put more effort on studies) among black students is stronger in racially mixed schools. Thus, segregation enforces group inequality through intra-group neighborhood effects, favoring the development of detrimental social norms among dominated groups.

The objective of this paper is to integrate economic and sociological elements in a model of human capital accumulation by phenotype-distinct individuals. Both kinds of elements are influenced by a common element: the degree of categorization endogeneity. By categorization endogeneity I mean the influence of endogenous elements, as behavioral traits, in group categorization. If categorization endogeneity is high, members of dominated groups can pass as members of dominant groups by, for example, adopting the behavioral norm associated with that group.

In the model, categorization endogeneity is set in the following way: self-categorization is exogenous, rooted in phenotypic characteristics, but hetero-categorization (categorization by others) is endogenous, in such a way that

members of the subaltern category may be seen by others as members of the dominant category if they choose to acquire education. On the one hand, categorization endogeneity facilitates the acquisition of qualification by members of subaltern groups on a market point of view. If higher wages, access to education, better jobs etc are reserved to members of dominant groups, individuals coming from dominated groups would be better-off if they can pass as members of the dominant group by adopting some behavioral traits, for example. In other words, categorization endogeneity decreases the “ability to discriminate”: distinguishing between members of the dominant group and idiosyncratic members of dominated groups is difficult if categorization is essentially endogenous.

A nice example to illustrate this point comes from the story of the Brazilian indigenous leader Marcos Terena.³ He managed to study until become a pilot of the Brazilian Air Force saying he was a “Japanese”, a term which is extended also to Japanese descendents in Brazil. Japanese is an ethnicity associated in Brazil with pro-mobility behavior, as diligence in school. Thus, by adopting the Japanese behavioral prescription and taking advantage of the phenotypic similarity, Terena was able to adopt a Japanese identity and had access to the elements which allowed his upward mobility.

On the other hand, categorization endogeneity can be harmful to the human capital accumulation among members of dominated groups from the sociological point of view, as it weakens the within-group neighborhood effects. Throughout this paper, I am especially concerned with intra-group neighborhood effects. As emphasized by the literature, mutual influences are stronger if individuals belong to the same category, that is, if they share the same sense of identity. If group identity is rooted in endogenous elements, as behavioral prescriptions, members of dominated groups acquiring qualification may be seen as deserters of the group. Thus, they may not be followed by the other members of the group. Continuing with Terena’s story, he was victim of hostility by many indigenous and seen by them as “White” due to his behavior. If categorization was less endogenous, he could be imitated by more individuals from his group.

Beside this introduction, this paper is divided in four more parts. Section 2 sets the theoretical framework, arguing how an endogenous categorization may weaken within-group neighborhood effects. The model is presented in Section 3. Section 4 makes an analysis of the dynamics of the model. Some concluding remarks take the last section.

³Terena published a letter telling his story in the Brazilian newspaper *Jornal do Brasil*.

The insights provided in this paper shed some light on the debate about the role played by segregation on the persistence of group inequality. Integration tends to increase categorization endogeneity. Segregated societies, thus, can present higher levels of group inequality if anti-discrimination laws are weakly enforced. On the other hand, if anti-discrimination laws are strongly enforced, segregated societies can present lower levels of group inequality.

1.2 Theoretical framework

1.2.1 Neighborhood effects

Neighborhood effects arise when individual decisions are influenced by the actions taken by other members of some reference group. In general they are justified along psychological and sociological lines (Durlauf, 2004).⁴ Using criminal behavior as reference, Glaeser & Scheinkman (2001) cite some channels through which neighborhood effects can take place, “ranging from pure physical externalities (while one person is being arrested, the police find it harder to arrest someone else), to learning from one’s neighbors, to stigma (the more people who are committing a particular crime—the less likely is that crime to be a negative signal) to pure taste externalities (individuals just enjoy imitating others)” (Glaeser & Scheinkman, 2001: 1).

Groups can be defined along various lines. The element which appears more frequently as a group glue is physical proximity: in this setting, individuals influence each other because they are physically near. In Evans et al (1992), for example, neighbors are the students of some school.

Nevertheless, a widespread literature, bringing insights from other social sciences, notably social psychology and sociology, suggests that social influence goes beyond geographic proximity. Rather, it has to do with how individuals are located in what Akerlof (1997) calls “social space”. This perception of neighborhood is supported by a sociological view of social interactions, based on “concepts that play little or no role in modern economics: class, community, culture, influence, status, gender roles, and so on” (Manski, 2000: 12).

I will term the first type of neighborhood as physical neighborhood and the second one, social neighborhood. For example, one’s physical neighborhood is

⁴An important exception concerns local public finance of education. In this case, children of poor neighborhoods are affected by the low level of local per pupil expenditure. To more on this, see Hussar & Sonnenberg (2001).

formed by her residential neighbors, her classmates, and all others who share with her some physical space. On the other hand, her social neighborhood is composed by those she identifies with: people from the same racial/ethnic group, from the same religion, and so on.

Social neighborhoods are not geographically limited. It can be said, for instance, that Nelson Mandela is a member of the social neighborhood of all those who sympathize with the African culture around the world, and that the Dalai Lama integrates the social neighborhood of all Buddhists and/or those who are favorable to the independence of Tibet. It is important to stress that there is a great overlap between the two kinds of neighborhood, as individuals prefer to interact with those they identify with.

The channels through which physical and social groups influence their members bear some similarities. With the exception of physical externalities, other channels as conformism and stigma are present in both kinds of groups. The norms enforced by social groups are called social norms (Elster, 1989) or behavioral prescriptions (Akerlof & Kranton, 2000). A universally familiar example of social categorization concerns gender. Within this kind of categorization, there are two social groups or categories, man and woman. To each social category, it is associated a set of behavioral prescriptions, which can be interpreted as the ideal behavior for each category. Following this example, there are behavioral prescriptions for gender categories regarding dressing (e.g., only women are supposed to wear dresses), jobs (e.g., firefighters are men, while nurses are women), family roles (the father is responsible for providing the financial resources, while the mother should stay at home taking care of the children), among other aspects.

Some studies present empirical evidence on the influence of physical neighborhood on individual behavior. Case & Katz (1991), analyzing young men in poor Boston neighborhoods, found significant peer effects on criminal behavior, drug and alcohol use, church attendance and labor market activity. Crane (1991) concludes that the percentage of workers with professional or managerial job in PUMS neighborhoods affects 16-19 years old women behavior regarding dropping out of high school and fertility. However, the importance of neighborhood effects is not consensual among empirical studies. Evans et al (1992), for instance, studying teenager behavior regarding dropping out of high school and pregnancy, found no evidence of neighborhood effects once endogeneity of neighborhood is controlled for by instrumental variables.

Empirical studies also show the importance of social neighborhoods. In

general, such effects are analyzed together with the impact of physical neighborhoods. For instance, Borjas (1992) stress the importance of the so-called “ethnic capital”, defined as the average skills of the ethnic group in the parents’ generation, on children skills. It was shown that ethnic capital matters even among individuals who grow up in the same neighborhood (Borjas, 1995). Another example is the study of Aizer & Currie (2004), which found evidence that the use of prenatal care public programs is highly correlated within groups defined using race/ethnicity and neighborhoods. Bertrand et al (2000) show that individuals surrounded by others who speak the same language increase their use of welfare programs if their language group also does so.

1.2.2 Neighborhood effects and group inequality

Group-led behavior can contribute to the persistence of group inequality. Unfavorable initial conditions can persist in locally segregated groups. This link can emerge due to a lot of reasons, as exemplified by Brock & Durlauf (2001): the individual cost in acquiring education can be negatively associated to one’s neighbors educational effort, children’s educational decision is influenced by observed education/occupation outcomes among adults in their community and the chance of making a successful job application depends on information possessed by members of one’s social network.

The norms engendered by social groups can also lead to group-based inequality. Indeed, as social norms are not outcome-oriented, there is no guarantee that will make all group members better-off (Elster, 1989). Dominated groups can develop behavioral prescriptions which are incompatible with socio-economic mobility, perpetuating their inferior position. In Akerlof & Kranton (2000) framework, for example, this is explained by exclusion per se. Discriminated groups would feel a strong anxiety if they adopted pro-mobility behavioral prescriptions, as exclusion would prevent them to follow such prescriptions. For example, some studies point that African American youth, recognizing societal iniquity in confront with their group, may come to feel education as of little usefulness for their economic and social mobility. Thus, adolescents identified with the Black culture may present targets of low academic achievement (Chavous et al, 2003).

In other approaches, anti-mobility behavioral prescriptions are more implicit. According to the social dominance theory (Pratto et al, 2006), for example, group inequality is seen as something natural by both dominant and, in a less

extent, dominated groups. Nothing should be done to change this situation. Group-based inequality is justified by the dissemination and acceptance of the so-called hierarchy-enhancing legitimizing myths (HE-LM):

Hierarchy-enhancing legitimizing myths (HE-LMs) provide moral and intellectual justification for group-based oppression and inequality. Examples include myriad forms of racism, sexism, heterosexism, stereotypes, notions of “fate,” just world beliefs, nationalism, Confucianism, the doctrine of meritorious karma, classism, the Divine Rights of Kings, Manifest Destiny, and internal attributions for poverty. Such disparate myths have been used to argue that inequality is fair, legitimate, natural, or moral. Hierarchy-enhancing legitimizing myths not only organize individual, group, and institutional behavior in ways that sustain dominance, they often lead subordinates to collaborate with dominants in the maintenance of oppression (Pratto et al, 2006: 7).

The same way neighborhood effects can lead to detrimental behavior, they can contribute to the erosion of group-based differences through the so-called social multiplier (Glaeser et al, 2002). Deviations from the group enforced behavior by some members can lead other group members to change their behavior too, eventually guiding the whole group towards a new set of norms, in such a way that group inequality is eliminated or at least diminished. Deviant behavior can have a lot of sources: individuals being affected by public policies; noises or mutations, as in stochastic evolutionary game theory models (e.g., Kandori et al, 1993); intentional idiosyncratic play (Bowles, 2004); or the presence of individuals not influenced by others’ actions, the fixed agents (Glaeser & Scheinkman, 2001).⁵

Not just physical neighborhoods, but also social neighborhoods can have their norms affected by deviant behavior. One example is the feminist revolution. Popularly, the feminist movement was launched in U. S. by the book *The Feminine Mystique*, written by Betty Friedan in 1963. After that, there was a great incursion of females in predominantly male occupations. In U. S., between 1970 and 1990, there was an increase of the percent female in virtually all 45 Census occupations, except in some traditionally female jobs (as dietitians

⁵Fixed agents are not just a theoretical curiosity. Experiments run by Falk et al (2003) show that about 10% of experiment’ participants were not influenced by their peers’ decisions regarding group contributions.

and speech therapists). Moreover, some former predominantly male occupations turned to be predominantly female, as underwriters and psychologists (Blau et al, 1998). It represented a change in female behavioral prescriptions concerning family roles (weakening of the housewife stereotype), as well as those related to occupations.

1.2.3 Endogenous and exogenous categorizations

It was argued that groups – of both physical and social nature – can enforce behaviors that can be detrimental to their members. A crucial point to understand what kind of neighborhood effects will emerge in a given society is the way individuals place themselves and others in social groups – the process known as categorization. To what categories the individual identifies with? Which individuals will be considered as members of these categories? On the answers to these questions depends the formation of both physical and social groups. These questions refer to the two dimensions of categorization: the way individuals group themselves and how individuals place others – self-categorization and heterocategorization, respectively.

Some categorizations are essentially exogenous. An example of this first type of categorization is gender categorization. In this case, individuals generally group themselves and others in one of the two categories – males and females – in an unambiguous way driven by easily observable exogenous characteristics.

Notwithstanding, other types of categorization are at least partially endogenous. Ethnic/racial categorizations are good examples of this second kind of grouping. In this case, categorization is driven not just by exogenous individual characteristics – as phenotype – but also by endogenous elements regarding the individual (e.g. social status) and the environment (e.g. social and historical context).

The fluidity of racial categorization is partially explained by the fact that an individual has at least three racial identities: an internal one (what she tells himself about his race), an external one (what others believe his race to be) and an expressed one (what she wants his actions and words to indicate to others about his race). These three types of racial identity need not be either identical (although they are not independent) or consistent across social contexts, being influenced by racial composition and ideology of contexts, as well as by the extent to which an individual is known in a particular setting (Harris & Sim, 2000).

The literature brings abundant evidence that ethnic/racial categorization may be essentially endogenous. For example, Miguel & Posner (2006), analyzing data from twelve African countries, concluded that ethnic identification is positively related to employment in non-traditional economic sectors and to the proximity of the survey to a competitive national election. Working with U.K. data, Bisin et al (2006) found that the main determinants of ethnic identity include past racial harassment experiences, language spoken at home and with friends, quality of housing, structure of the family and degree of neighborhood segregation. Even a country as United States, in which there already was a legal definition of race – and, thus, supposed to have a more exogenous racial categorization – presents a significant degree of racial endogeneity.⁶ In the U. S. prior to the Civil War, marked by racist rules, African descendents, especially mulattoes, could be “white” by behavior and reputation (Bodenhorn & Ruebeck, 2003).

If categorization is significantly endogenous, the boundaries between dominant and dominated groups are much more fluid. Membership in the dominant (dominated) group is associated with the adoption of a pro-(anti-) mobility behavior. For instance, in Rwanda, the Tutsi is the dominant group and the Hutu, the dominated one. Thus, those with lots of cattle were classified as a Tutsi, and the poorer ones, as Hutu (Bowen, 1996).

1.2.4 Endogenous categorization and neighborhood effects

As argued before, deviations from group enforced behavior can lead to the displacement of group norms. Nonetheless, the endogeneity of categorization poses a challenge to such a process. If grouping is rooted in exogenous, easily observable elements, identity is not affected by behavior. In this case, idiosyncratic individuals will be still seen as members of some reference group. On the other hand, if categorization is endogenous, membership in the reference group is evaluated on the basis of the commitment with group’s behavioral prescriptions. If one plays idiosyncratically, departing from group’s behavioral prescriptions, she can be expelled from the reference group.

The transition to a new set of group enforced norms is easier in the first case than in the second one. An example will illustrate better this point. Suppose some group is characterized by a low level of human capital accumulation. In

⁶In this country, “the records of governmental specification of rules of racial identity associated with peoples of African descent were established both through legislation and court decisions (Darity Jr. et al, 2006: 288)”.

order to combat group inequality, the government implements some public policy with the objective of increasing human capital accumulation by the members of this group. Due to variation in the personal willingness of accumulate human capital, just some members of this group, in a first moment, decide to augment their human capital stock.

What will happen with the remaining, more conformist members of the group? If categorization is exogenous, it is not affected by individual choices. Thus, the deviant members will be still seen as members of the group. Consequently, the more conformist members of the group will perceive an increase in the average human capital accumulated by group members and they will be stimulated to doing the same. With the majority of group members changing their choices, the group prescribed behavior would transit from a low-level human capital accumulation to a high-level human capital accumulation.

On the other hand, if categorization is endogenous, deviant members would no more be seen as members of the group, as they are breaking with the group' prescribed behavior. So, conformist members would not perceive an increase in the average accumulated human capital of the group. They would tend not to change their levels of human capital accumulation and the transition to a new group rule would not occur.

It clearly has important implications regarding the overriding of group inequality. If categorization is endogenous, members of dominated groups adopting a pro-mobility behavior can lose identity links with the more conformist members of the group. The group stimulus to these members to choose a pro-mobility behavior is weaker, as the idiosyncratic members would be seen as "deserters" of the group.

1.3 The Model

The following model will formalize the ideas presented above. There is population composed by genetically distinct individuals. There are two social categories in this society: the Blues and the Greens. A fraction β of this population owns a gene G, which generates a physical, easily observable characteristic associated with the Green social group. For instance, this gene can be associated with skin darkness and the Green group can be the Black social category. This society is also characterized by group hierarchy, in such a way that the Blues are the dominant group and the Greens, the dominated one.

Individuals live for two periods. In the first one, or childhood, they choose to acquire education or not. In the second period, adulthood, they will work as qualified or unqualified employees. When she arrives at the second period, the individual generates, by cloning, a genetically identical child. At the end of the second period, the individual dies and her child becomes an adult. Thus, the population is composed by two generations of equal and constant size. Let us normalize this size to one.

Social categorization occurs in the following way: self-categorization is exogenously (genetically) determined, but heterocategorization follows both exogenous and endogenous lines. Thus, individuals with (without) the gene G self-classify as Green (Blue). On the other hand, individuals are classified by others as Green or Blue not just according to their physical appearance, but also according to their educational choice. As the Blues are the social dominant group, they have as behavioral prescription the pro-mobility attitude, that is, the acquisition of education. Similarly, the Greens are supposed not to acquire education. The probability of an individual i be classified as member of group j is equal to

$$P_{i,j} = (1 - \mu_j)G_{i,j} + \mu_j E_{i,j}$$

In the equation above, $G_{i,j}$ is equal to one if the phenotype of individual i corresponds to the phenotype associated with category j , and zero otherwise. Similarly, $E_{i,j}$ is equal to one if the behavior of individual i matches the prescribed behavior of category j , being zero otherwise. The parameter μ_j is equal to $0.5\alpha_j$, where α_j varies between zero and one and measures the degree of endogeneity of category j , being α_G greater than α_B . For sake of simplicity, let us set α_B equal to zero⁷ and call α_G simply α .

Therefore, individuals without gene G are classified by others as Blues. Individuals with the gene are classified as Green with probability 1 if not acquiring education, but they can be classified as Blue with probability μ if acquiring education. Note that if α is equal to one, an educated Green is randomly classified

⁷This simplifying assumption has a strong empirical support. In their study using Brazilian data, Telles & Lim (1998) shows that, while 88% of Whites were consistently classified (that is, self-classification is consistent with other classification), this value was 58.5% for Blacks. Moreover, more educated self-classified Blacks were more likely to be classified as Whites. It suggests that categorization endogeneity works much more as an upward mechanism rather than a downward device: the entrance in the dominant group through the adoption of its behavioral prescriptions is easier than the downward grading to the dominated group of misbehaving members of the dominant group.

by others as Blue or Green.

In case of acquiring education, an individual self-classified as member of group j enjoys the following pay-off:

$$\pi_{i,j,t} = a_i r(P_{i,j}) + (1 - a_i) \gamma (1 - \hat{s}_{j,t}).$$

In the equation above, a_i is the individual level of ability, which ranges between zero and one. $r(P_{i,j})$ is the announced “wage per ability” for the next period. Note that it depends on how the individual is socially placed. The parameter γ is the cost of acquiring education. By definition, γ is supposed to be the same for both groups. Finally, $\hat{s}_{j,t}$ is the observed fraction of educated members of group j at time t .

Individuals with higher ability level earn higher wages, as well as present less difficult in acquire education. Moreover, the individual is influenced by the educational choices made by the members of the group she belongs to. The higher the observed fraction of educated contemporaneous members of her reference group, the easier will it be for her to become educated too. In case of not acquiring education, the individual will have a pay-off equal to zero.

Employers are willing to pay a wage r to qualified Blue employees, but, due to taste discrimination, they set a wage equal to $r - d$ to Green qualified workers, where d reflects the degree of discrimination and is smaller than r . However, as in μ percent of the time a qualified Green worker will be classified as Blue, the expected wage for qualified Green workers will be

$$r_G = r - (1 - \mu)d.$$

Let $s_{B,t}$ and $s_{G,t}$ be, respectively, the real fractions of Blues and Greens who opted to acquire education at time t . The observed fractions will be

$$\hat{s}_{B,t} = \frac{(1 - \beta)s_{B,t} + \mu s_{G,t}}{(1 - \beta) + \mu s_{G,t}}$$

$$\hat{s}_{G,t} = \frac{\beta(1 - \mu)s_{G,t}}{\beta[(1 - s_{G,t}) + (1 - \mu)s_{G,t}]} = \frac{(1 - \mu)s_{G,t}}{1 - \mu s_{G,t}}$$

In the equation that represents the observed fraction of qualified Blue individuals, the denominator shows the fraction of individuals who are viewed as Blues in the society, that is, all individuals who are genetically Blue and the fraction μ of idiosyncratic Greens. The numerator is the share of such individ-

uals that acquired education. The observed fraction of educated Greens can be explained in a similar fashion. It is important to stress that, if racial ambiguity is null, observed and real fractions of skilled workers are equal.

Individuals will decide to acquire education if their respective pay-offs are greater than zero. Those with higher levels of ability are more prone to become educated, so it can be said that an individual will acquire education if her ability level is above some threshold level \tilde{a} . Ignoring time subscripts, these levels are, for each social group, equal to

$$\tilde{a}_B = \frac{\gamma(1 - \hat{s}_B)}{r + \gamma(1 - \hat{s}_B)}$$

$$\tilde{a}_G = \frac{\gamma(1 - \hat{s}_G)}{r_G + \gamma(1 - \hat{s}_G)}$$

Therefore, at time $t + 1$, the fraction of educated individuals will be equal to the fraction of individuals whose ability was greater than \tilde{a} at time t . To simplify, let us suppose that ability is uniformly distributed between zero and 1 for both genetic groups. In this case, we have

$$s_{j,t+1} = 1 - \tilde{a}_{j,t}, \quad j = B, G \quad (1.1)$$

1.4 Dynamics of the model

A point $\{s_B^*, s_G^*\}$ is stationary if it is a solution to the system of difference equations represented by (1.1). Thus:

$$s_j^* = 1 - \tilde{a}_j(s_B^*, s_G^*), \quad j = B, G$$

Furthermore, the stationary point is stable if the Jacobian matrix of the dynamical system at this point has all eigenvalues strictly less than one. The system analyzed here has three possible stable stationary points:⁸

⁸There is a fourth fixed point, but it is not stable. See Appendix for details.

$$\{s_B^*, s_G^*\} = \begin{cases} \{1, 1\} \\ \left\{1, \frac{2r_G}{r_G - (1-\alpha)r + 2\gamma}\right\} \\ \left\{\frac{r}{1-\beta} \left(\frac{1}{\gamma} - \frac{2\beta}{r_G - (1-\alpha)r + 2\gamma}\right), \frac{2r_G}{r_G - (1-\alpha)r + 2\gamma}\right\} \end{cases}$$

I will call these states, respectively, the high level state (HS), the unequal state (US) and the low level state (LS). It is important to stress that LS is also an unequal state, since in this situation the fraction of qualified Blue individuals will never be inferior to the share of educated Green individuals. The existence and stability of these points depend on the cost of education. I will set two crucial values of γ , $\gamma^G = (1 - \mu)r_G$ and $\gamma^B = \gamma^G + k$, where

$$k = \frac{1}{8} \left\{ [2r - d(4 - \alpha)](\alpha - 2) + \sqrt{(\alpha - 2)^2(2r + \alpha d)^2 + \frac{32\alpha r r_G}{1 - \beta}} \right\}$$

is a non-negative constant. It can be shown that:⁹

- If $0 < \gamma < \gamma^G$, HS is the unique stationary stable state.
- If $\gamma^G < \gamma < \gamma^B$, US is the unique stationary stable state.
- If $\gamma > \gamma^B$, LS is the unique stationary stable state.

Thus, under small values of γ , all members of both groups would acquire education. If γ is sufficiently high, just a fraction of both groups will acquire education. Finally, under intermediate values of γ , all members of the dominant group and a fraction of the dominate group would acquire education. It is important to stress that γ^B represents the educational cost below which all Blue individuals will choose to be qualified and γ^G is the cost below which all Greens will choose to acquire education. The better condition for the qualification of Blue individuals can be seen by the fact that γ^B is greater than γ^G . Note also that γ^G is the expected return for qualified Greens multiplied by the “ability to discriminate”, which reaches its maximum value (one) when endogeneity is zero.

⁹The demonstration is in the Appendix.

It is important to stress that the equilibria are Pareto-rankable. LS is the worst one. US is Pareto-superior to LS, as the fraction of qualified Blue individuals increases without a decrease in the fraction of qualified Green individuals. Finally, HS is Pareto-superior to US, given that the fraction of qualified Green individuals goes to one.

It can be shown that

$$\frac{\partial \gamma^B}{\partial \alpha} = \frac{1}{4} \left[d(1 - \alpha) - r - \frac{r_G[r - d(1 - 2\alpha)](2 - \alpha)[\alpha d(1 - \beta) - 2r(1 + \beta)]}{(1 - \beta)\sqrt{(\alpha - 2)^2(2r + \alpha d)^2 + \frac{32\alpha r r_G}{(1 - \beta)}}} \right]$$

which is non-negative. In fact, the higher the level of categorization endogeneity, the greater is the probability of incorporation of qualified Green workers in the Blue reference group. Moreover,

$$\frac{\partial \gamma^G}{\partial \alpha} = \frac{1}{2}[d(2 - \alpha) - r],$$

which is negative if $d < \frac{r}{2 - \alpha}$. The effect of higher levels of racial ambiguity in γ^G is twofold. First, it increases the expected wage for qualified Green workers, as they will be more likely misclassified as Blue. Second, it decreases the “ability to discriminate”, weakening the positive externalities. It occurs because, in this situation, qualified Green workers are “expelled” from the Green reference group with a greater probability.

Thus, for sufficiently low levels of discrimination, the endogeneity of categorization turns the unequal state more likely. This is shown in Figure 1.1. If d is smaller than $\frac{r}{2 - \alpha}$ [Figure 1.1(a)], higher values of endogeneity of categorization increases the range of values of educational cost for which the unequal state is stable. Conversely [Figure 1.1(b)], if discrimination is high, this range is broader and is more constant regarding the level of categorization endogeneity.

Therefore, a less discriminatory society may experience a higher difficulty in implementing group educational equality than a more discriminatory society if they differ in their level of categorization endogeneity. Suppose there are two societies, A and B, which differ just in two elements: the level of discrimination and the degree of categorization endogeneity. Discrimination is higher in A ($d_A > d_B$), but categorization is more endogenous in B ($\mu_B > \mu_A$). Both societies are composed by two groups. In order to guarantee that all members of both groups will acquire education, government should set the educational

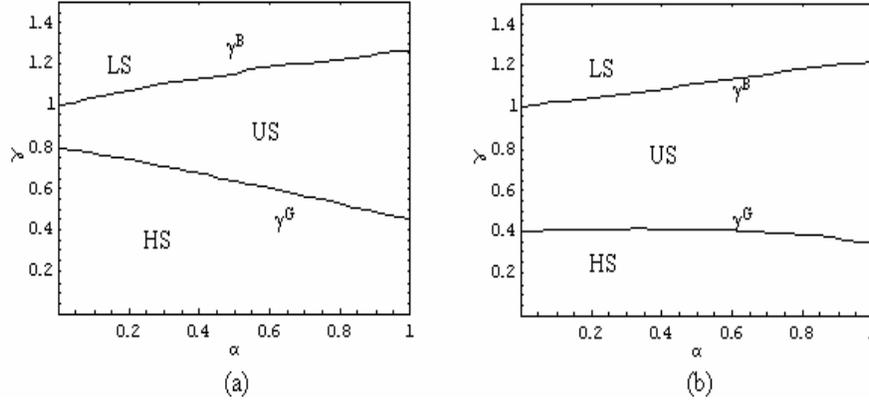


Figure 1.1: States which are stable for each combination of α and γ . The graphic on the left (a) corresponds to $d = 0.2$ and the one on the right (b), to $d = 0.6$. The other parameters assumed in the construction of the figure are $r = 1$ and $\beta = 0.5$.

cost below γ^G . It is possible that the effort to achieve this objective is higher for society B – that is, that γ_A^G is higher than γ_B^G . Simple algebraic manipulation shows such will occur only if

$$\Delta\mu > \frac{(1 - \mu_A)^2}{r - d_B(2 - \mu_A - \mu_B)} \Delta d,$$

where $\Delta\mu = \mu_B - \mu_A$ and $\Delta d = d_A - d_B$, with the condition $d_B < \frac{r}{2 - \mu_A - \mu_B}$. Thus, a less discriminatory society can experience a greater difficulty in reaching full educational achievement than a more discriminatory one, if the difference between their levels of categorization endogeneity were sufficiently higher than the difference between their degrees of discrimination.

1.5 Concluding remarks

A model of qualification acquisition by phenotypically distinct individuals was presented above. It was shown that, under sufficiently small levels of discrimination, the endogeneity of the categorization turns the unequal state more likely: the higher the degree of endogeneity, the wider is the range of values of the educational cost for which the unequal state is asymptotically stable.

The results presented here shed some light on the discrepancies regarding the

impact of segregation on the persistence of group inequality. Segregation limits ethnic or racial admixture, making easier the categorization through individual phenotypic characteristics. Conversely, when categorization through exogenous, easily observable features is difficult or not possible, individuals are placed according to other elements, as behavioral traits (Humphreys et al, 2002). Thus, segregation reduces the endogeneity of categorization.

Therefore, segregation would be positively related with group inequality when anti-discriminatory laws are not effectively enforced. In this situation, although intra-group neighborhoods effects are strong, members of subaltern groups are heavily penalized by discrimination. It seems to be the case of the scheduled castes in India.¹⁰

On the other hand, segregation would contribute to the erosion of group differences when discrimination was bellowing some degree. In this case, the losses coming from the weakening of neighborhood effects would overcome the gains stemming from the smaller “ability to discriminate”. It helps to understand why group inequality is decreasing faster in a more segregated country, as South Africa, than in a more integrated country, as Brazil, even if discrimination seems to be higher in the former than in the latter.¹¹

1.A Appendix: Fixed Points and Stability

Making $s_{B,t} = s_{B,t+1}$ and $s_{G,t} = s_{G,t+1}$ and simplifying, we have the following solutions to the equations represented in (1.1):

$$\{s_B^*, s_G^*\} = \begin{cases} \{1, 1\} \\ \left\{1, \frac{2r_G}{r_G - (1-\alpha)r - 2\gamma}\right\} \\ \left\{\frac{r[1-\beta(1-\mu)]}{\gamma(1-\beta)}, 1\right\} \\ \left\{\frac{r}{1-\beta} \left(\frac{1}{\gamma} - \frac{2\beta}{r_G - (1-\alpha)r + 2\gamma}\right), \frac{2r_G}{r_G - (1-\alpha)r - 2\gamma}\right\} \end{cases}$$

¹⁰The Indian Constitution, existing since 1950, prohibits any kind of discrimination against inferior castes. Nonetheless, the effective application of this rule is not observed. Crimes against Dalits, the lower caste, in general while they are attempting to exercise legal rights, are still very common in the country (Meerman, 2001). As a result, caste differences, including regarding educational attainment, persists in the country (Kijima, 2006).

¹¹Racial segregation in Brazil is only moderate when compared with that of South Africa (Telles, 1992). Moreover, discrimination in the labor market is apparently lower in the former country than in the latter. A study conducted by Lam (2002), for example, shows that, after controlling for education and other variables, the White/Black wage gap in South Africa and Brazil were, respectively, 3.4 and 1.3. However, educational mobility among Blacks is higher in South Africa than in Brazil (Lam 1999, 2002).

These points will be termed FP (fixed point) 1, 2, 3 and 4, respectively. The Jacobian matrix of the form

$$J = \begin{bmatrix} \frac{\partial s_{B,t+1}}{\partial s_{B,t}} & \frac{\partial s_{B,t+1}}{\partial s_{G,t}} \\ \frac{\partial s_{G,t+1}}{\partial s_{B,t}} & \frac{\partial s_{G,t+1}}{\partial s_{G,t}} \end{bmatrix}$$

has the following eigenvalues (ignoring time subscripts):

$$\frac{4\gamma(2-\alpha)[2r-d(2-\alpha)]}{\{[2r-2d(2-\alpha)](\alpha s_G-2)-4\gamma(1-s_G)\}^2} \quad (1.2)$$

$$\frac{2r(1-\beta)[2-\beta(2-\alpha s_B)]\gamma}{\{r[2-\beta(2-\alpha s_B)]+2\gamma(1-s_B)(1-\beta)\}^2} \quad (1.3)$$

A FP $\{s_B^*, s_G^*\}$ will be stable if the eigenvalues of $J\{s_B^*, s_G^*\}$ are strictly smaller than 1. Substituting FP1 in (1.2) and (1.3) and simplifying, we have

$$\left\{ \frac{\gamma}{r_G(1-\mu)}, \frac{\gamma(1-\beta)}{r[1-\beta(1-\mu)]} \right\}$$

The first eigenvalue is greater than the second one. To see this, note that $r \geq r_G$ and $\frac{(1-\beta)}{[1-\beta(1-\mu)]} \leq 1$. Thus, if the first one is smaller than one, so are both. It will occur if $\gamma < (1-\mu)r_G$. Thus this is the condition for stability of FP1.

Substituting FP2 in (1.2) and (1.3) and simplifying, we have

$$\left\{ \frac{r_G(1-\mu)}{\gamma}, \frac{\gamma(1-\beta)(\alpha r_G + 2\gamma)}{\alpha r r_G + 2r\gamma(1-\beta)} \right\}$$

The first eigenvalue is smaller than one if γ is greater than $r_G(1-\mu)$. This is also the condition which guarantees that s_G^* exists, that is, is between zero and one. The second one is smaller than one if γ is smaller than

$$r_G(1-\mu) + \frac{1}{8} \left\{ [2r-d(4-\alpha)](\alpha-2) + \sqrt{(\alpha-2)^2(2r+\alpha d)^2 + \frac{32\alpha r r_G}{1-\beta}} \right\}$$

Substituting FP3 in (1.2) and (1.3) and simplifying, we have

$$\left\{ \frac{\gamma}{(1-\mu)[r-d(1-\alpha)]}, \frac{r[1-\beta(1-\mu)]}{\gamma(1-\beta)} \right\}$$

The first eigenvalue is smaller than one if γ is smaller than $(1 - \mu)[r - d(1 - \alpha)]$. However, under this condition, the second eigenvalue is greater than one. Thus, FP3 can not be stable.

Finally, substituting FP4 in (1.2) and (1.3) and simplifying, we have

$$\left\{ \frac{r_G(1 - \mu)}{\gamma}, \frac{r}{1 - \beta} \left(\frac{1}{\gamma} - \frac{2\beta}{\alpha r - d(1 - \mu) + 2\gamma} \right) \right\}$$

The second eigenvalue is greater than the first one. Thus, both will be smaller than one if γ was greater than

$$r_G(1 - \mu) + \frac{1}{8} \left\{ [2r - d(4 - \alpha)](\alpha - 2) + \sqrt{(\alpha - 2)^2(2r + \alpha d)^2 + \frac{32\alpha r r_G}{1 - \beta}} \right\}$$

It also guarantees that both s_G^* and s_B^* are between zero and one. Thus this condition is sufficient for the existence and stability of FP4.

Chapter 2

Endogenous Race and Intergenerational Educational Mobility

Abstract: An extensive literature sustains that educational mobility of disadvantaged racial groups tend to be lower in racially segregated societies. However, it is not observed in two of the most notorious cases of racial inequality in the world: Brazil and South Africa. Non-Whites in the latter country, despite living in a much more racially segregated society, present a higher educational mobility than non-Whites living in the former country, widely known as a racial democracy. In this paper, I develop an evolutionary game model to explore an element that partially explains this puzzle, which is exactly one of the key differences between the two countries: racial endogeneity, defined as the influence of endogenous elements (as social status or behavioral traits) in the racial categorization. If racial categorization is essentially endogenous, interactions take place mainly between individuals with the same behavioral trait, rather than the same phenotype. It prevents children of poorly educated parents from enjoying a better social capital, as better educated parents interrelate mostly with other educated parents. The model states that the higher the degree of racial endogeneity, the more persistent are the initial conditions regarding educational attainment. Implications for public policy are discussed.

Key-words: racial endogeneity, racial inequality, social capital.

JEL Classification: C73; D63; I21.

2.1 Introduction

In his 1973's paper, Kenneth Arrow suggested that discrimination in the labor market would be eliminated by competition: capital would flow to the less discriminatory, more profitable firms, making taste-based discriminatory firms disappear in the long run. Observing the persistence of race-based differences, the author recognized the incompleteness of the market-based approaches in explaining racial inequality. The following quotation summarizes this point: "I am going to suggest in this paper that market-based explanations will tend to predict that racial discrimination will be eliminated. Since they are not, we must seek elsewhere for non-market factors influencing economic behavior. The concepts of direct *social interaction* and networks seem to be good places to start" (Arrow, 1998: 2, italics added).

Going in hand with this view, there is an extensive literature dealing with the relationship between social interactions and persistence of racial inequality. The seminal work in this vein is Loury (1977), which spawned a fruitful literature. Some examples are Bowles et al (2007), Bowles & Sethi (2006), Chaudhuri & Sethi (2008) and Sethi & Somanathan (2004). A first basic assumption underlying this literature is that unfavorable initial conditions can persevere in locally segregated groups. This link can emerge due to a lot of reasons, as exemplified by Brock & Durlauf (2001): the individual cost of acquiring education can be decreasing in the average effort in education in one's neighborhood, children's educational decision is influenced by observed education/occupation outcomes among adults in their community and the chance of making a successful job application depends on information possessed by members of one's social network. Thus, people living in deprived communities may experience greater difficulties in escaping poverty.

The second basic hypothesis is that interactions, in general, follow racial lines. Thus, harsh initial conditions of disadvantaged racial groups (as Blacks in some Western countries) are more likely to persist. These studies share the general conclusion that, in highly racially segregated societies, racial inequality can be very resistant through time.

A fundamental implication of this relationship between racial segregation and persistence of racial inequality is that intergenerational mobility of disadvantaged racial groups should be lower in segregated communities. As stressed by Loury (1977): "In a racially stratified society where individuals, of their own volition, socially group themselves along racial lines, we may expect the

intergenerational status transmission mechanism to differ for families of different racial groups (p. 8)". Considering acquiring education as the main kind of human capital accumulation, in more integrated societies, the horizontal effects of highly educated neighbors (maybe most of them from the advantaged racial group) can overcome the vertical effects of poorly educated parents, leading children in this situation to a higher level of school attainment than their parents.

However, this is not verified in two of the most notorious cases of racial inequality: Brazil and South Africa. In both countries, Whites present a higher educational mobility than Blacks.¹ Nevertheless, empirical studies conducted by Lam (1999, 2002) suggest that Black children with poorly educated parents are much more penalized in Brazil than in South Africa, that is, the curve describing the relationship between children' and parents' education has both a higher average and a flatter slope in the former country than in the first. At each age and at each mother's years of schooling level, mean schooling is higher for non-White South Africans children than for non-White Brazilian children (Lam, 1999: 16-17).

According to the above presented literature, the expected result would be the opposite, as Brazil is a much more racially integrated society than South Africa. Racial segregation in the country is only moderate when compared with that of countries as United States and South Africa (Telles, 1992). Conversely, South Africa presents a very low degree of racial integration, result of decades of the apartheid regime. Furthermore, a study by Christopher (2005) argues that the rate of desegregation presented a negligible increase with the end of apartheid in 1994, suffering a decline after a rush in the 90's, and that just the coloreds appear to be experiencing a significant degree of reintegration.

In this paper, I develop an evolutionary game model to explore an element that partially explains this puzzle, which is exactly one of the key differences between the two countries: racial endogeneity. Racial endogeneity is defined as the influence of endogenous elements (as social status or behavioral traits) in the racial categorization, that is, the way individuals are racially placed. The endogenous component of race may be very high in countries as Brazil, where race was never defined by law. In these cases, race may assume a behavioral character: individuals are racially classified not just according to their physical appearance, but also according to their behavior.

¹On the intergenerational educational mobility of racially distinct groups in South Africa, see Nimubona & Vencatachellum (2007) and, on the Brazilian case, Ferreira & Veloso (2003).

A high level of racial endogeneity may lead to a behavior-driven pattern of interactions (individuals interacting mainly with those with the same behavior) rather than a phenotype-based pattern of interactions. In such a situation, children with poorly educated parents will live in low human capital level neighborhoods, not receiving neither the vertical (from parents) nor the horizontal (from neighbors) stimulus to acquire education. On the other hand, if interactions are based on physical characteristics, both educated and non-educated parents with the same phenotype will share the same neighborhood, what may enhance the educational mobility of this group.

This paper has more four parts. Section 2 sets the theoretical foundation of this analysis, discussing the endogeneity of race and the role of parents' neighborhood choices in children behavior. The model is presented in Section 3. The dynamics of the model is discussed in Section 4. Some conclusions take the last part.

2.2 Theoretical framework

2.2.1 The endogeneity of race

Individuals prefer to interact with those perceived as similar to them and race is one of the most usual elements to evaluate similarity/dissimilarity. Traditional economic analysis on racial issues consider race as an exogenous parameter established around biological roots. In this view, interactions take place mainly between individuals with similar phenotypic characteristics.² However, this idea of an exogenous racial categorization is largely contested by other social sciences.

Following Hewstone et al (2002), there are five major motivational theories of group identity formation. The social identity theory (e.g., Tajfel & Turner, 1979) points that in-group bias serves to create or protect high in-group status. Optimal distinctiveness theory (Brewer, 1991) proposes that individuals are motivated to identify with groups that provide an optimal balance between the need for assimilation and the need for differentiation. Subjective uncertainty reduction theory (Hogg, 2000) suggests that people are motivated to identify with social groups that provide clear normative prescriptions for behavior to reduce subjective uncertainty. Terror management theory (Solomon et al, 1991)

²It is important to stress that an absolute distaste for interracial interactions is not a necessary condition for this phenomenon. Schelling (1971) argues that even integrationist preferences can give rise to racial segregation.

sets that people have a need for self-preservation, so they evaluate in-group members positively because similar others are assumed to support, and therefore validate, their own cultural worldview. Finally, social dominance theory (Pratto et al, 2006) proposes that society contains ideologies that either promote or attenuate intergroup hierarchies. Individual differences to the extent that competing ideologies are accepted are represented by social dominance orientation (SDO). Individuals with a high SDO have a strong desire to promote intergroup hierarchies and for their in-groups to dominate their out-groups.

Thus, the process of identity formation – including racial identity formation – is driven by a wide range of elements beside exogenous characteristics, as gender or skin color. The fluidity of racial categorization is partially explained by the fact that an individual has at least three racial identities: an internal one (what she tells herself about his race), an external one (what others believe her race to be) and an expressed one (what she wants her actions and words to show others about her race). These three types of racial identity are interdependent, but need not be either identical or consistent across social contexts. Moreover, they are influenced by racial composition and ideology of contexts, as well as by the extent to which an individual is known in a particular setting (Harris & Sim, 2000).

Suppose the first and the third types of racial identity are identical – the race one identifies with is the one a person acknowledges before others as being her own race. In this case, there are two kinds of racial identity: self-categorization – how the individual racially classifies herself – and heterocategorization – how the individual is racially placed by others. Self- and heterocategorization are both expressions of social identity, which “refers to social categorizations of self and others, self-categories that define the individual in terms of his or her shared similarities with members of certain social categories in contrast to other social categories” (Turner et al, 1994).

Empirical studies bring abundant evidence that racial self-categorization may be essentially endogenous. For example, Miguel & Posner (2006), analyzing data from twelve African countries, concluded that ethnic identification is positively related to employment in non-traditional economy sectors and to the proximity of the survey to a competitive national election. Working with U.K. data, Bisin et al (2006) found that the main determinants of ethnic identity include past racial harassment experiences, language spoken at home and with friends, quality of housing, structure of the family and degree of neighborhood segregation. Analyzing the Add Health survey, which collects data of U.S.

adolescents in grades 7 through 12, Harris & Sim (2002) concluded that context affects one's choice of a single-race identity.

One of the main endogenous elements which affect categorization – including the racial one – are behavioral traits. A universally familiar example of social categorization concerns gender. Within this kind of categorization, there are two social groups or categories, man and woman. To each social category, it is associated a set of behavioral prescriptions (Akerlof & Kranton, 2000), which can be interpreted as the ideal behavior for each category. Following this example, there are behavioral prescriptions for gender categories regarding dressing (e.g., only women are supposed to wear dresses), jobs (e.g., firefighters are men, while nurses are women), family roles (the father is responsible for providing the financial resources, while the mother should stay at home taking care of the children), among other aspects.

Self-categorization and behavioral traits are correlated, as identification with some group spawns a process of commitment with some behavioral prescriptions called in psychology internalization of rules of behavior: “Identification is a critical part of this internalization process: a person learns a set of values (prescriptions) such that her actions should conform with the behavior of some people and contrast with that of others” (Akerlof & Kranton, 2000: 728). For example, some studies point that African-American youth, recognizing societal iniquity in confront with their group, may come to feel education as of little usefulness for their economic and social mobility. Thus, adolescents identified with the Black culture may present targets of low academic achievement (Chavous et al, 2003).

Also heterocategorization is influenced by behavioral traits. Bowen (1996), for instance, relates that, in Rwanda, racial/ethnic sorting relies mainly on personal wealth. Those with lots of cattle were classified as a Tutsi, and the poorer ones, as Hutu. Even a country as United States, in which there already was a legal definition of race – and, thus, supposed to have a more exogenous racial categorization – presents a significant degree of racial endogeneity.³ In the U. S. prior to the Civil War, marked by racist rules, African descendents, especially mulattoes, could be “white” by behavior and reputation (Bodenhorn & Ruebeck, 2003).

Therefore, the concept of race has two dimensions: an exogenous one, rooted

³In this country, “the records of governmental specification of rules of racial identity associated with peoples of African descent were established both through legislation and court decisions (Darity Jr. et al, 2006: 288)”.

on phenotypic characteristics, and an endogenous one, based on behavioral traits. The endogenous component of race may have an expressive weight and the literature is plenty of examples of such situation. It clearly influences the pattern of interactions. Individuals prefer interact with those perceived as similar to them, as those they see as belonging to their racial group. If racial categorization is strongly affected by behavioral elements, interactions will tend to follow behavioral lines. As it will be argued in the next subsection, it brings important implications not just for one's choices, but also for one's children's choices.

2.2.2 Two emblematic cases: Brazil and South Africa

Although race is an essentially endogenous kind of categorization, societies present different degrees of race endogeneity. On the one hand, there are countries in which the endogeneity of racial categorization is particularly accentuated. On the other hand, racial categorization is more exogenous in other cases. Two very representative cases of each situation are, respectively, Brazil and South Africa.

The former country presents a high degree of racial endogeneity. As in most of Latin American countries, individuals are racially sorted on the grounds of their endogenous characteristics, as social status. This kind of racial categorization was termed by Wagley (1965) as social race. On the other hand, in South Africa, racial boundaries are strictly delimited by exogenous elements, as phenotype and ancestry.

The character of racial endogeneity in Brazil follows the idea that historically discriminated groups are associated with behavioral prescriptions which are incompatible with socio-economic mobility. It can occur due, for instance, to exclusion per se – discriminated groups would feel a strong anxiety if they adopted pro-mobility behavioral prescriptions, as exclusion would prevent them to follow such prescriptions (Akerlof & Kranton, 2000) – or to an implicit acceptance of group inequality as something natural, as in the social dominance theory (Pratto et al, 2006). In fact, racial categorization in Brazil is strongly affected by education. Researches driven by the sociologist Edward Telles (Telles, 2002; Telles & Lim, 1998), since a nationwide survey conducted in 1995 by one of the main Brazilian newspapers, show that educated self-classified Blacks are more likely to be heteroclassified as Whites. Analyzing a sample of 243 students in a public school in São Paulo City, Carvalho (2005) concludes that teachers

tend to “whiten” children with better grades.

The relationship between race and education in Brazil comes from its early history. Since the nineteenth century – that is, still under the slavery regime – some African descendents, mainly mulattoes, managed to experience some upward social mobility, in general through education (Azevedo, 1996 [1953]). When it happened, however, the individual was immediately risen to the “White” category.⁴

The difference between the two countries regarding racial categorization is rooted in their historical processes, which bear some similarities. In both countries, between the early fifteenth and mid-sixteenth centuries, European settlers – the Portuguese in Brazil and the Dutch in South Africa – established slavery-based colonies in which there was a clear phenotype-based hierarchy: whiteness was associated with freedom and domination, while darkness was associated with servitude (Fredrickson, 2001). Slavery abolition came in the nineteenth century – but half a century later in Brazil.

Nevertheless, each country followed a very different route in the post abolitionist period. While the Brazilian society evolved to a racial democracy (Freyre, 1933), accentuating the miscegenation already present in the country since the sixteenth century, South Africa adopted strict segregationist rules which culminated with the establishment of apartheid in 1948. During this regime, which lasts until 1994, individuals were assigned to one of the four racial identities according to ancestry lines: White, Colored, Indian and African. This categorization regulated a wide range of aspects as schooling and occupations. Interracial marriages were not allowed. Later, in order to strengthen the struggle against apartheid, the non-White categories created a composite “Black” identity (Darity Jr. et al, 2006).

Miscegenation has a positive relationship with racial endogeneity. Individuals feel an intrinsic necessity to set themselves apart in groups. When this is not possible through phenotypic characteristics, categorization is rooted in other elements as, for example, behavioral checks (Humphreys et al, 2002). Until nowadays the rate of racial admixture diverges considerably between the two countries. Whilst in South Africa, in 2000, self-classified coloreds accounted for 8.4% of the population (Van der Berg & Louw, 2004), in Brazil this value was

⁴An interesting dialog is described in Rugendas (1989 [1827;1835]:83). A Britain immigrant in Brazil called Koster, in the beginning of the XIX century, asked to his mulatto servant if a certain Captain was really a mulatto too. The servant answered: “He was, but he is no more a mulatto”. Seeing that his lord did not have understood, he concluded: “Sir, have you ever seen a mulatto Captain?”

superior 38%.

There are some theories which try to explain why Brazil became a melting pot, but not South Africa, which validity is rejected by most of scholars. Some of them emphasize a natural predisposition of the Portuguese to interracial relations (Freyre, 1933), while others stress the scarcity of women in the Portuguese colonies, differently from other European settlements, or a more humanitarian slavery regime, resulting from the Catholic principle of equality (Marx, 1998). One of the main reasons for this difference between the two countries seems to have a demographic character. A model of race amalgamation, which took place in Brazil, could not be applied to South Africa, as it would lead to the assimilation of Whites to Blacks, due to the overwhelming majority of the latter category (Fredrickson, 2001).

There was another crucial element which led to racial segregation in South Africa, but that was absent in Brazil. South Africa emerged out of a bloody conflict – the Boer Wars in the nineteenth century – which resulted in racial tensions (even between whites) that could abort the consolidation of the South African nation. The British, who were the winners, sought a coalition with the defeated Afrikaners because they were seen capable to cause a violent disruption. Despite their majority, Blacks were not seen as a menace due to their ethnic division and the widespread idea of their racial inferiority. Thus, the solution found to racial conflicts was a white coalition subduing the black majority (Marx, 1998).

2.2.3 Vertical and horizontal effects

As stressed above, the pattern of interactions is drawn by both exogenous and endogenous elements. Moreover, the relative influence of each kind of element can differ substantially among societies. Whilst in some of them interactions take place mainly between individuals with alike behavioral traits, in others they occur essentially among phenotypically similar persons.

There is a vigorous literature on neighborhood effects which stresses the impact of one's interactions on one's individual decisions.⁵ For instance, one who interacts with highly educated individuals may be more diligent at school, as the individual cost in acquiring education can be negatively associated to one's neighbors educational effort (Brock & Durlauf, 2001).

⁵An excellent survey of the neighborhood effects literature is Durlauf (2004).

Moreover, this influence extends also to one's offspring. Roughly speaking, children are subject to two effects. The first one is the vertical effect, which comes from parents. There is a strong relationship between parents' and children's educational choices. This link can emerge, for example, because parents' human capital influences their earnings, and their earnings affect investment in children's skills and learning (Becker & Tomes, 1986), or because educated parents have higher ability in helping their children with homework (Lam, 1999). The second one is the horizontal effect, that is, the neighborhood effects stemming from those of the same cohort. It can be the case that children of educated parents, living in poorly educated neighborhoods, decide to acquire less education than their parents if the vertical effects are sufficiently weaker than horizontal effects. An opposite situation is also possible, again supposing strong horizontal effects: children with poorly educated parents can acquire more education than their parents if living in highly educated neighborhoods.

Horizontal effects can also refer to the adults living in the child's neighborhood. In role model effects (Streufert, 2000), it is shown how the characteristics of older members in a community influences younger member's educational choices. This idea is underpinned by empirical studies. The studies conducted by Borjas (1992, 1995) show that children's skills depend on average skills of the ethnic group in the parents' generation, the so-called ethnic capital. Even among individuals who grow up in the same neighborhood ethnic capital matters when children are exposed to individuals who share the same ethnic background. Overman & Heath (2000), working with Australian data, concluded that teenagers are more likely to drop out of school if they live in neighborhoods with a high percentage of adults with vocational qualifications – even when the qualifications of each parent have been controlled for – maybe because this variable is a proxy for the extent and usefulness of local job information networks or local labor market characteristics. Ainsworth (2002) found that a greater prevalence of high-status residents – whose measure is a standardized composite of the proportion of college graduates among adults over 24 years old and the proportion of employed persons with professional or managerial occupations – strongly predicts more time spent on homework and higher mathematics/reading test scores of 8th grade students.

Beside their direct influence, parents also have an indirect effect on their children decisions by affecting the horizontal stimulus their children will be exposed to through their neighborhood choice. As stressed by Bisin et al (2006): “Parents also realize that socialization is partially the product of the social

interaction their children engage into, which they affect by choosing e.g., which neighborhood to live in, the school children attend, their social circle of friends and acquaintances, the civic/social clubs and churches they belong to” (p. 3).

In general, parents act intentionally in order to transmit their cultural traits to their offspring. They use a socialization technology to influence the traits that will be acquired and developed by their children. This socialization technology includes elements as, for instance, homogamy (intragroup marriage), spending time with children, choosing appropriate neighborhoods, schools, and acquaintances, and attending church (Bisin & Verdier, 2000). Patacchini & Zenou (2004) also argues that there is a cultural complementarity, in the sense that, for high educated parents, the better the quality of the neighborhood in terms of human capital, the higher the parent’s involvement in children’s education.

Summing up the literature reviewed in the pages above, we have the following crucial points:

- Racial categorization is essentially endogenous.
- The individual adopting behavior B will probably identify with group G, for which B is a behavioral prescription. At the same time, in an endogenous race context, the individual will classify as belonging to G who have adopted B. Therefore, the more race is endogenous, the more the interactions will take place among individuals that have adopted the same behavior.
- The pattern of interactions adopted by parents will decisively influence the horizontal effects their children will be exposed to and, consequently, their social choices.

The following model formalizes these core ideas.

2.3 The Model

Let us define *group* as a set of phenotypically homogeneous individuals. Each group is divided between mothers and their respective children. The number of mothers and children are normalized to one, so total group population is equal to two. Each agent lives two time units. When the child arrives at the second period, she becomes a mother and generates, by cloning, a genetically identical child. At the same time, his mother completes the life cycle and dies. Thus, individuals abandoning the model are automatically replaced and the size of the group population is kept constant.

Let us call *family* the set composed by the mother and her child. Mothers are

responsible for the pattern of interactions that will be followed by the family. In other words, mothers will choose the family's neighborhood. Interactions follow racial lines but, as it will be discussed below, race has both an endogenous and an exogenous element. On the other hand, children must choose between two alternatives: acquire or not education.

Let p_t be the fraction of educated mothers, or adults, at time t . In the next period, this fraction will be represented by

$$p_{t+1} = q_t p_t + r_t(1 - p_t) = p_t(q_t - r_t) + r_t \quad (2.1)$$

In the above equation, q_t is the fraction of children with educated mothers which opted to acquire education at time t and r_t , the fraction of children with non-educated mothers which opted to acquire education.

2.3.1 Neighborhood formation

As stressed above, adults are responsible for neighborhood formation. They will interact with each other randomly in the population. When two adults interact, they will decide to establish a link between them or not. It will occur if both consider the other as belonging to his own racial group. The probability that an individual i consider individual j as belonging to his own race is

$$P_{i,j} = \alpha B_{i,j} + (1 - \alpha)F_{i,j}$$

The variable $B_{i,j}$ refers to behavior and assumes the value one if i and j have the same behavior, being zero otherwise. The variable $F_{i,j}$ refers to phenotype, assuming the value 1 if both phenotypes are equal. The parameter α is the degree of racial endogeneity and shows how much racial categorization relies on the endogenous element (behavior) rather than in the exogenous one (phenotype). In an extreme situation, if α is equal to one, race is completely endogenous, individuals see as belonging to his own race just those that behave as him. On the other hand, if α is equal to zero, racial categorization is totally driven by phenotype.

If two adults agree in establishing a link between them, they will become direct neighbors. As stressed above, all group population has the same phenotype. The probability two adults to become neighbors is equal to the probability that both will accept the other as member of his racial group. Thus, if they have the same behavior, this value is equal to one. If their behaviors are different, this

probability is $(1 - \alpha)^2$.

2.3.2 Children's social capital

Let us define $\theta_{E,t}(\theta_{N,t})$ as the fraction of educated adults in the child's neighborhood at time t in case she has an educated (non-educated) mother. They will be called hereafter the children's social capital.⁶ These values are represented by the following equations:

$$\theta_{E,t} = \frac{p_t}{p_t + (1 - p_t)(1 - \alpha)^2} \quad (2.2)$$

$$\theta_{N,t} = \frac{p_t(1 - \alpha)^2}{p_t(1 - \alpha)^2 + (1 - p_t)} \quad (2.3)$$

In the equations above, the denominator represents the mother's number of direct neighbors. In the case of educated mothers, she will have as direct neighbors all other educated mothers plus a fraction $(1 - \alpha)^2$ of the non-educated mothers. The numerator is equal to the number of her educated direct neighbors. The case of the non-educated mothers can be explained in a similar fashion.

By choosing to be educated, the child will benefit from the return on education ρ , but will pay the cost of acquiring education. This cost is decreasing in her social capital level. By choosing to be non-educated, the child will enjoy a null pay-off. Educated children's pay-offs can be represented by the following function

$$\pi_{j,t} = \rho - c(1 - \theta_{j,t}), \quad j = E, N \quad (2.4)$$

By definition, c is greater than ρ .

2.4 Dynamics of the model

The time-variation of q and r are represented by the following replicator dynamics:

⁶This is a very minimalistic concept of social capital. To a deeper discussion of its meaning, see the seminal work by Coleman (1988).

$$\Delta q = q(1 - q)\pi_E^* \quad (2.5)$$

$$\Delta r = r(1 - r)\pi_N^* \quad (2.6)$$

In the equations above, Δq and Δr are $q_{t+1} - q_t$ and $r_{t+1} - r_t$, respectively. Additionally, π_E^* and π_N^* are the values assumed by π_E and π_N when the other variables are in equilibrium. These equations reflect the idea that, for higher values of the pay-off for acquiring education, there will be an increase in the fraction of children choosing to become educated. The equilibrium values of q and r , q^* and r^* , will be defined by the condition $\Delta q = 0$ and $\Delta r = 0$. In this case, equation (2.1) reduces to

$$p_{t+1} = p_t(q^* - r^*) + r^* \quad (2.7)$$

The equilibrium value of p , p^* , satisfies the condition $p_{t+1} = p_t$. Thus, p^* is equal to

$$p^* = \frac{r^*}{1 - (q^* - r^*)} \quad (2.8)$$

Substituting (2.8) in (2.2) and (2.3), θ_E^* and θ_N^* are obtained. These values are substituted in (2.4) to obtain π_N^* and π_E^* . Finally, the results are substituted in (2.5) and (2.6). The functions $r(q)$ that define $\Delta q = 0$ and $\Delta r = 0$ are, respectively,

$$\begin{aligned} r_1(q) &= (1 - q)k_1 \\ r_2(q) &= (1 - q)k_2 \end{aligned}$$

where

$$k_1 = \frac{(1 - \alpha)^2(1 - \delta)}{\delta}, \quad k_2 = \frac{(1 - \delta)}{\delta(1 - \alpha)^2} \text{ and } \delta = \frac{\rho}{c}.$$

As c is greater than ρ , δ is between zero and one and both k_1 and k_2 are positive. Moreover, as k_2 is not smaller than k_1 , the line $\Delta r = 0$ will always lie above the line $\Delta q = 0$. The dynamics of the model can be represented by the graphics depicted in Figure 2.1. Higher values of q (r) raise π_N (π_E), leading to increases in r (q). Thus, q (r) increases in the area above $\Delta q = 0$ ($\Delta r = 0$).

There are three possible stationary values for p^* : zero (when $q^* = r^* = 0$), 1 (when $q^* = r^* = 1$) and its initial value, p_0 (when $q^* = 1$ and $r^* = 0$).⁷

2.4.1 Basins of attraction

Let us call B_1 , B_0 and B_S , respectively, the basin of attraction of $\{p^* = 1\}$, $\{p^* = 0\}$ and $\{p^* = p_0\}$. There are three possible sets of values for B_1 , B_0 and B_S . The first one is when both k_1 and k_2 are between zero and one. The second one is when $0 < k_1 < 1$ and $1 < k_2$ and the third one is when both are above one. The existence of some of these situations depends on the value of δ . Let us first define two limiting values of δ :

$$\delta_{MIN} = \frac{(1 - \alpha)^2}{1 + (1 - \alpha)^2}$$

$$\delta_{MAX} = \frac{1}{1 + (1 - \alpha)^2}$$

It can be shown that:

- If $\delta > \delta_{MAX}$, $0 < k_1 < k_2 < 1$ (Situation 1).
- If $\delta_{MIN} < \delta < \delta_{MAX}$, $0 < k_1 < 1$ and $1 < k_2$ (Situation 2).
- If $\delta_{MIN} > \delta$, $1 < k_1 < k_2$ (Situation 3).⁸

Table 2.1 gives the values of the basins of attraction in each one of the three cases.

Table 2.1: *Basins of attraction*

Situation	δ	B_0	B_1
1	$\delta > \delta_{MAX}$	$\frac{k_1}{2}$	$\frac{k_2+1}{2}$
2	$\delta_{MIN} < \delta < \delta_{MAX}$	$\frac{k_1}{2}$	$\frac{1}{2k_2}$
3	$\delta_{MIN} > \delta$	$1 - \frac{1}{2k_1}$	$\frac{1}{2k_2}$

Obs.: B_S is simply $1 - B_0 - B_1$.

⁷Clearly, if just the children of educated mothers acquire education and considering the constancy of population size, the fraction of educated adults will not change through time.

⁸The proof of this proposition is straightforward. To be in Situation 1, as k_2 is greater than k_1 , a sufficient condition is k_2 smaller than 1, what will occur if $\delta > \delta_{MAX}$. Similarly, a sufficient condition to be in Situation 3 is k_1 greater than 1, that is, $\delta < \delta_{MIN}$. Finally, if δ is between the two values, k_2 is greater than 1, but k_1 is smaller than 1 (Situation 2).

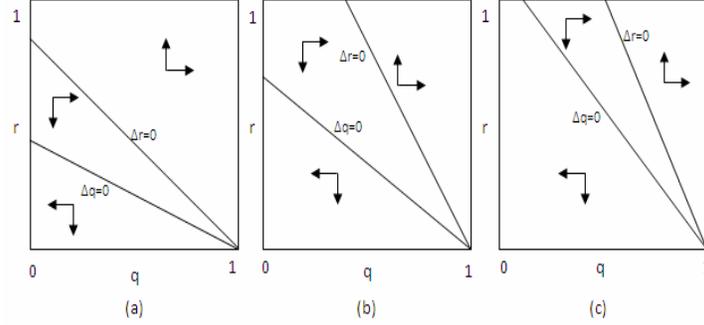


Figure 2.1: Situation 1 (a), 2 (b) and 3 (c).

In Situation 1, B_1 is greater than $\frac{1}{2}$, so this is the greatest basin of attraction and, consequently, $\{p^*=1\}$ is the more likely state. Similarly, in Situation 3, B_0 is greater than $\frac{1}{2}$, being $\{p^*=0\}$ the state with the largest basin of attraction. In fact, the rate educational return/educational cost positively affects the educational attainment. Just in Situation 2 anyone of the three basins of attraction can be the largest one. Each situation is depicted in Figure 2.1.

Specifically in Situation 2, it is possible to see that

$$\begin{aligned}\frac{\partial B_0}{\partial \alpha} &= -\frac{(1-\alpha)(1-\delta)}{\delta} \\ \frac{\partial B_1}{\partial \alpha} &= -\frac{(1-\alpha)\delta}{(1-\delta)} \\ \frac{\partial B_S}{\partial \alpha} &= -\frac{(1-\alpha)[(1-\delta)^2 + \delta^2]}{\delta(1-\delta)}\end{aligned}$$

Thus, higher levels of racial endogeneity make $\{p^*=0\}$ and $\{p^*=1\}$ less likely, while make $\{p^*=p_0\}$ more probable. Moreover,

$$B_1 - B_0 = \frac{(1-\alpha)^2(2\delta-1)}{2\delta(1-\delta)}$$

Therefore, B_1 is greater than B_0 if δ is greater than $\frac{1}{2}$. Regarding $\{p^*=p_0\}$, it will have the greatest basin of attraction if α is greater than

$$\alpha_{MAX} = 1 - \sqrt{\frac{\delta(1-\delta)}{\delta^2 + (1-\delta)^2}}$$

in the case B_1 is greater than B_0 or if α is greater than

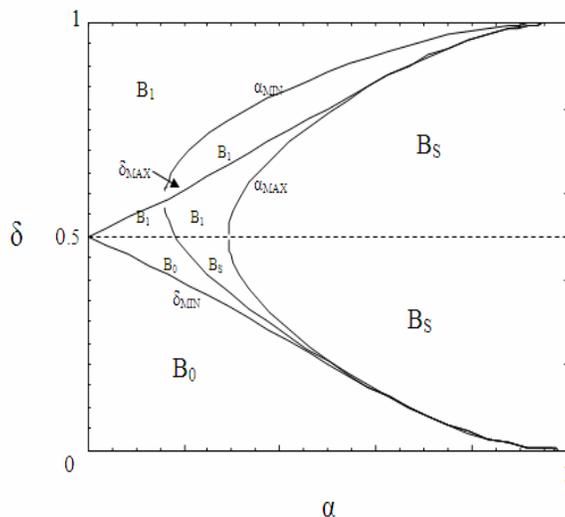


Figure 2.2: Greatest basin of attraction, for each combination of α and δ .

$$\alpha_{MIN} = 1 - \sqrt{\frac{2\delta(1-\delta)}{\delta^2 + 2(1-\delta)^2}}$$

if B_0 is greater than B_1 . Figure 2.2 summarizes these points, showing the greatest basin of attraction for each combination of α and δ . It shows that $\{p^*=1\}$ becomes more likely vis-à-vis $\{p^*=0\}$ as δ increases and that $\{p^*=p_0\}$ becomes more likely than the other equilibria as α increases.

2.4.2 The “Brazilian” and the “South African” paradigms

This model is able to capture the basic features of the observed differences between Brazil and South Africa regarding racial educational mobility. In a very stylized fashion, the Brazilian paradigm can be thought of as a situation in which the racial endogeneity reaches its maximum value, that is, is equal to 1. In this case, k_1 is equal to zero, k_2 goes to infinite and the unique possible equilibrium is $\{p^* = p_0\}$. In fact, if individuals interact just on the basis of behavior – (non) educated adults interacting just with (non) educated adults – the fraction of educated adults will keep constant.⁹ Note that, as endogeneity

⁹Although it is not the main subject of this paper, it is interesting to note that an implication of the model is that the overall educational mobility in Brazil should be lower than that observed in South Africa, what is corroborated by empirical studies (Lam, 1999; Hertz et al,

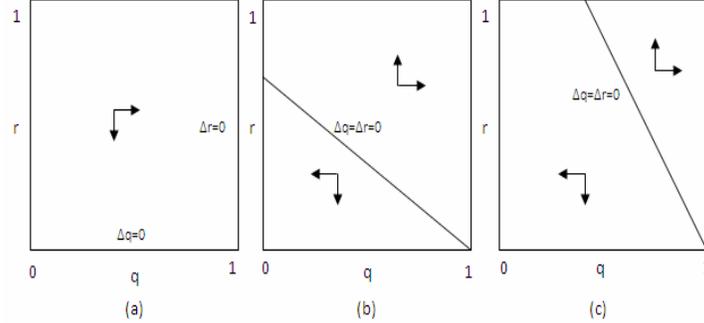


Figure 2.3: The Brazilian paradigm (a), the South African paradigm for a dominant (b) and for a dominated (c) group.

is equal to one, phenotype does not influence interactions and the phenotype diversity of the real Brazilian society does not affect this result. Nothing can be done in terms of public policy to combat a pre-existent phenotype-based inequality. This situation is illustrated in Figure 2.3(a).

On the other hand, the South African paradigm has the following characteristics: there are two groups in the population, “Blacks” and “Whites”, very well defined along exogenous characteristics of the individuals. Hence, racial endogeneity is equal to zero. Both k_1 and k_2 will be equal to $\frac{(1-\delta)}{\delta}$, thus there is no room for the equilibrium $\{p^* = p_0\}$. The only two possible equilibria are $\{p^* = 1\}$ and $\{p^* = 0\}$. Interactions take place just within groups, so the fractions of educated individuals in each group are independent. Suppose there is group discrimination, in such a way that each group enjoys a different level of δ . Let δ_W and δ_B be the δ level for Whites and Blacks, respectively. As the Whites are the benefited group, δ_W is greater than δ_B . In the case of Whites (Blacks), $\{p^* = 1\}$ ($\{p^* = 0\}$) is the more likely state, as shown in Figures 2.3(b) and 2.3(c), respectively. To fight against group inequality, the government can adopt policies in order to increase δ_B .

2.5 Concluding remarks

This paper presents an evolutionary game-based model of educational mobility. Individuals prefer to interact with those seen as belonging to their same race, but the concept of race has two components: an exogenous one (phenotype)

2007).

and an endogenous one (educational attainment). The pattern of interactions chosen by the parents will influence the social capital enjoyed by their children and, consequently, their educational choices. It was argued that, the higher the level of racial endogeneity (that is, high influence of behavioral traits on racial categorization), the higher is the persistence of initial conditions regarding educational attainment.

This model is able to capture the basic features of the observed differences between Brazil and South Africa regarding racial educational mobility. Looking at Figure 2.3, it is possible to see that phenotype-based inequality can be more severe in the South African paradigm. In this case, it is possible full educational attainment to be the equilibrium for the dominant group while zero educational attainment to be the equilibrium for the dominated one. Nonetheless, two points should be stressed. First, in the South African paradigm group differences can be explained solely by differences in the δ enjoyed by each group. Thus, policies targeting group equality need basically enforce the Equal Opportunity Doctrine (Loury, 1977).

By contrast, in the Brazilian paradigm, it could be not enough. Phenotype-based inequality could persist even in the presence of equality regarding educational costs and returns on education. Group equality policies in this paradigm ought to take into account more complex issues concerning racial identity. For instance, affirmative action policies may accentuate stereotypes, reinforcing interactions based on behavioral traits and harming the social capital of poorly educated individuals. The analysis suggests that, in this paradigm, policies should be oriented to the reduction of racial endogeneity in the negative sense – that is, to the erosion of negative stereotypes – rather than to changes in the rate educational cost/benefit.

Second, the public effort in terms of policy to achieve group equality is lower in the South African paradigm. Suppose the government is able to set δ through some public policy. The greater the degree of racial endogeneity, the higher should be the value of δ in order to conduct the whole society to a high level of educational attainment. Therefore, the higher educational mobility observed in South Africa may be explained in the following way: due to the negligible racial endogeneity, equal opportunity policy is sufficient to achieve full group equality concerning educational attainment;¹⁰ moreover, the cost of such policy

¹⁰In fact, successive Black protests led to increases in the δ relative to this group. For instance, there was the Education and Training Act of 1979, which followed the 1976 Soweto uprising and replaced the Bantu Education Act of 1953. It certainly reduced the cost of

is minimized by the exogenous racial categorization. It is stressed, thus, how challenging it is to overcome group inequality in racially mixed societies as Brazil.

The results presented in this paper suggest that segregation may favor group equality. This idea is not new in the literature. For instance, mixed neighborhoods can contribute to the constitution of “oppositional identities” (Bisin et al, 2006), where the behavioral norms associated with the dominant group are rejected by members of the dominated group. The study of Fryer & Torelli (2005), showing that the punishment to “acting white” behaviors (e.g., put more effort on studies) among black students is stronger in racially mixed schools, corroborate this view. The novelty here is that segregation may be good for the educational mobility of discriminated groups by placing together both educated and non-educated members of these groups.

acquire education for the Blacks in South Africa. To more on educational policy in South Africa during apartheid, see Fataar (2001). Another example was the end of job reservation that came with the collapse of the apartheid in 1994, which increased the returns on education for Blacks.

Chapter 3

Endogenous Categorization and Neighborhood Effects

Abstract: This paper raises the hypothesis that intra-group neighborhood effects, in case of dominated groups, are weaker under endogenous categorization circumstances when a pro-mobility behavior is considered. If categorization is essentially endogenous, changes in individual behavior can make her depart from the group prescribed behavior. It increases the probability of this individual be no longer seen as a member of the group and, thus, her actions will have low or null influence on other members' behavior. Applying the methodology developed by Glaeser et al (2002), this hypothesis is empirically tested using data from the Metropolitan Region of São Paulo (Brazil). A sample of 15-17 year-old teenagers is divided in four groups (males, females, whites and afro-descendents) and neighborhood effects on the decision of attending school are estimated for each one of them. The results corroborate the above mentioned hypothesis: when the exogenous categorization (gender) is considered, there is no evidence that the neighborhood effects for the dominated group (females) are weaker than those for the dominant group. On the other hand, when the endogenous categorization is considered (race), the neighborhood effects for the dominated group (afro-descendents) show to be weaker than those for the dominant group (whites).

Key-words: education, neighborhood effects, social categorization.

JEL Classification: Z13; I21; I38.

3.1 Introduction

In May 2001, following a long period of racial tensions, there was a short but violent riot in Oldham, a city near to Manchester, England. It was the first of a series of racially-motivated conflicts which took place also in Bradford, Leeds and Burnley. These events became known as the British 2001 Summer of Violence Riots. The clashes occurred mainly between Whites and South Asian-Muslim groups. One of the reasons of these conflicts was that poor whites were unsatisfied with the council funding which favored minority groups.

In June 2007, the Gujjars, an ethnic group from Northern and Western India composed mainly by shepherds and farmers, began demanding they be declared a Scheduled Tribe (ST), which entitles them to government jobs and college quotas. Fearing they would lose their quota slice, the Meenas, another tribal group, protested against this demand. It led to violent clashes between the two groups, blocked roads, damaged railways and more than 20 killed people.

These are some examples of how costly – and not just in the economic sense – group-oriented policies can be. Thus, the benefits of such policies should be measured as accurately as possible. Group-targeted policies entail a direct effect: college quotas, for instance, led to an increase in the school enrolment of the benefited group. In addition, these policies also engender indirect effects. Observing that some members of their group are enrolling school, other members of the benefited group are influenced to do the same. Such indirect effects can be called intra-group neighborhood effects.

A vigorous literature is dedicated to the empirical study of neighborhood effects. These effects are shown to be relevant in the explanation of a wide set of individual behaviors, ranging from crime to school attainment. There is not a unique, well defined concept of neighborhood. Neighborhoods can be defined along physical lines. In this case, neighborhood is a set of physically close individuals, as classmates or residential neighbors. On the other hand, other studies incorporate insights from other social sciences, as social psychology and sociology, and assume identity as an important component of neighborhood formation. Thus, neighbors would be those who identify with the same group or culture, as an ethnic group, regardless of their geographic distance.

Thus, categorization – the process through which individuals place themselves and others in social categories – is a key determinant of the neighborhood effects that will take place in a given society. Individuals are more influenced by those they take as similar. Moreover, interactions are mostly endogenous.

Individuals tend to interact with those they identify with. Thus, categorization also influences the formation of physical neighborhoods.

Some categorizations are essentially exogenous. The most obvious example of this kind of categorization is gender grouping. Individuals follow very unambiguous and easily observable exogenous characteristics to map themselves and others as men or women. In this case, neighborhood effects tend to be very strong, since a woman, for example, will be always correctly identified as so and will be followed by other women in her actions.

Nevertheless, some categorizations are essentially endogenous. This is the case of ethnic/racial categorization. How an individual is racially placed depends on her behavior. Groups have behavioral prescriptions associated with them. In highly endogenous categorizations, the more an individual is close to the behavioral prescription of some group, the more likely she will be classified by others as a member of this group. Therefore, in the case of endogenous categorizations, neighborhood effects tend to be weaker, given the possibility of an individual to be “expelled” from some reference group according to her attitude.

In this paper I test empirically this hypothesis, comparing the neighborhood effects stemming from an exogenous categorization (gender) with neighborhood effects stemming from an endogenous categorization (race). It is important to stress that I am concerned here with intra-group neighborhood effects, in the sense that I will analyze how individuals belonging to the same group influence each other. The utilized data are the 2000 Census from the Metropolitan Area of São Paulo, Brazil. The results corroborate the above mentioned hypothesis: when the exogenous categorization (gender) is considered, there is no evidence that the neighborhood effects for the dominated group (females) are weaker than those for the dominant group. On the other hand, when the endogenous categorization is considered (race), the neighborhood effects for the dominated group (afro-descendants) show to be weaker than those for the dominant group (whites).

Beside this introduction, this paper has four other parts. Section 2 discusses the theoretical framework relative to neighborhood effects and the endogeneity of some categorizations, notably racial categorization. Section 3 sets the model. The data and the regression results are presented in Section 4. Some conclusions take the last part.

3.2 Theoretical framework

3.2.1 Identity and neighborhood effects

Neighborhood effects can be defined as the influence of actions taken by members of some reference group on individual decisions. In general they are justified along psychological and sociological lines (Durlauf, 2004).¹ Using criminal behavior as reference, Glaeser & Scheinkman (2001) cite some channels through which neighborhood effects can arise, “ranging from pure physical externalities (while one person is being arrested, the police find it harder to arrest someone else), to learning from one’s neighbors, to stigma (the more people who are committing a particular crime—the less likely is that crime to be a negative signal) to pure taste externalities (individuals just enjoy imitating others)” (Glaeser & Scheinkman, 2001: 1).

Some econometric studies present evidence on the influence of neighborhoods on individual behavior.² Case & Katz (1991), analyzing young men in poor Boston neighborhoods, found significant peer effects on criminal behavior, drug and alcohol use, church attendance and labor market activity. Crane (1991) concludes that the percentage of workers with professional or managerial job in PUMS neighborhoods affects 16-19 year-old women behavior regarding dropping out of high school and fertility. However, the importance of neighborhood effects is not consensual among empirical studies. Evans et al (1992), for instance, studying teenager behavior regarding dropping out of high school and pregnancy, found no evidence of neighborhood effects once endogeneity of neighborhood is controlled for by instrumental variables.

Neighborhoods can be defined along various lines. In general, they are defined by geographic proximity: in this setting, individuals influence each other because they are physically near. In Evans et al (1992), for example, neighbors are the students of some school. Nevertheless, a widespread literature, bringing insights from other social sciences, notably social psychology and sociology, suggests that social influence goes beyond geographic proximity. Rather, it has to do with how individuals are located in what Akerlof (1997) calls “social space”. This perception of neighborhood is supported by a sociological view of social interactions, based on “concepts that play little or no role in modern economics:

¹An important exception concerns local public finance of education. In this case, children of poor neighborhoods are affected by the low level of local per pupil expenditure. To more on this, see Hussar & Sonnenberg (2001).

²Other sources of empirical evidence on neighborhood effects include ethnographic studies and controlled experiments. Durlauf (2004) contains an excellent survey of this literature.

class, community, culture, influence, status, gender roles, and so on” (Manski, 2000: 12). Thus, identity is also an important source of neighborhood effects – social influences are stronger when individuals are connected by identity ties.

Neighborhoods defined along identity lines – or social neighborhoods – enforce norms known as social norms (Elster, 1989) or behavioral prescriptions (Akerlof & Kranton, 2000). A universally familiar example of social categorization concerns gender. Within this kind of categorization, there are two social groups or categories, man and woman. To each social category, it is associated a set of behavioral prescriptions, which can be interpreted as the ideal behavior for each category. Following in this example, there are behavioral prescriptions for gender categories regarding dressing (e.g., just women are supposed to wear dresses), jobs (e.g., firefighters are men, while nurses are women), family roles (the father is responsible for providing the financial resources, while the mother should stay at home taking care of the children), among other aspects.

Some studies bring evidence that identity matters for neighborhood effects. For instance, Borjas (1992) stress the importance of the so-called “ethnic capital”, defined as the average skills of the ethnic group in the parents’ generation, on children skills. It was shown that intra-neighborhood ethnic capital matters for individual outcomes (Borjas, 1995). Another example is the study of Aizer & Currie (2004), which found evidence that the use of prenatal care public programs is highly correlated within groups defined using race/ethnicity and neighborhoods. Bertrand et al (2000) show that individuals surrounded by others who speak the same language increase their use of welfare programs if their language group also does so.

3.2.2 Endogenous and exogenous categorizations

It was argued that neighborhood effects are enhanced by identity. Therefore, a crucial point to understand what kind of neighborhood effects will emerge in a given society is the way individuals place themselves and others in social groups – the process known as categorization. To what categories the individual identifies with? What individuals will be considered as members of these categories? On the answers to these questions depends the formation of both physical and social groups. These questions refer to the two dimensions of categorization: the way individuals group themselves and how individuals place others – self-categorization and heterocategorization, respectively.

Some categorizations are essentially exogenous. An example of this first type

of categorization is gender categorization. In this case, individuals generally group themselves and others in one of the two categories – males and females – in an unambiguous way driven by easily observable exogenous characteristics.

Notwithstanding, other types of categorization are at least partially endogenous. Ethnic/racial categorizations are good examples of this second kind of grouping. In this case, categorization is driven not just by exogenous individual characteristics – as phenotype – but also by endogenous elements regarding the individual (e.g. social status) and the environment (e.g. social and historical context).

The fluidity of racial categorization is partially explained by the fact that an individual has at least three racial identities: an internal one (what she tells himself about his race), an external one (what others believe his race to be) and an expressed one (what she want his actions and words indicate to others about his race). These three types of racial identity need not be neither identical, although they are not independent, nor consistent across social contexts, being influenced by racial composition and ideology of contexts, as well as by the extent to which an individual is known in a particular setting (Harris & Sim, 2000).

The literature brings abundant evidence that ethnic/racial self-categorization may be essentially endogenous. For example, Miguel & Posner (2006), analyzing data from twelve African countries, concluded that ethnic identification is positively related to employment in non-traditional economic sectors and to the proximity of the survey to a competitive national election. Working with U.K. data, Bisin et al (2006) found that the main determinants of ethnic identity include past racial harassment experiences, language spoken at home and with friends, quality of housing, structure of the family and degree of neighborhood segregation. Harris & Sim (2002), since a sample composed by U.S. youth in grades 7 through 12, concluded that context and racial groups involved affect one's choice regarding race.

Similarly, heterocategorization may be highly affected by endogenous elements. In this situation, the closer an individual is to the prescribed behavior of some category, the more likely she is of being classified by others as a member of this group. Analyzing a sample of 243 students in a public school in São Paulo City, Carvalho (2005) concludes that teachers tend to “whiten” children with better grades. Even a country as United States, in which there already was a legal definition of race – and, thus, supposed to have a more exogenous

racial categorization – presents a significant degree of racial endogeneity.³ In the U. S. prior to the Civil War, marked by racist rules, African descendents, especially mulattoes, could be “white” by behavior and reputation (Bodenhorn & Ruebeck, 2003).

Both self-categorization and heterocategorization are influenced by behavioral traits. However, there is no reason for both dimensions of categorization to be equally affected by behavioral characteristics. Although they are not independent, these two dimensions are not necessarily equal. Thus, a consequence of the endogeneity of categorization is the disentanglement between self- and other-categorization. Empirical evidence goes in hand with this view. Researches driven by the sociologist Edward Telles (Telles, 2002; Telles & Lim, 1998), since a nationwide survey conducted in 1995 by one of the main Brazilian newspapers, show that self-classified Blacks are more likely to be heteroclassified as Whites the more educated they are. On the other hand, other-classified Whites are more prone to classify themselves as Blacks or “Pardos” (mixed race) if they are highly educated.

3.2.3 Endogenous categorization and neighborhood effects

The endogeneity of categorization poses a challenge to the overcoming of group differences. It comes through the weakening of neighborhood effects. A first point is that, in general, socially dominated groups are attached to behavioral prescriptions which are incompatible with socio-economic mobility, which perpetuates their inferior position. One possible explanation for this fact is exclusion per se (Akerlof & Kranton, 2000). Suppose, for example, that some discriminated group has a limited access to schooling. Members of this group would feel a strong anxiety if they adopted attending school as a behavioral prescription, as exclusion would prevent them to follow such prescription. Chavous et al (2003) argue that African American youth, recognizing societal iniquity in confront with their group, may come to feel education as of little usefulness for their economic and social mobility. Thus, adolescents identified with the Black culture may present targets of low academic achievement.

In other approaches, anti-mobility behavioral prescriptions are more implicit. According to the social dominance theory (Pratto et al, 2006), for example, group inequality is seen as something natural by both dominant and, in a less

³In this country, “the records of governmental specification of rules of racial identity associated with peoples of African descent were established both through legislation and court decisions (Darity Jr. et al, 2006: 288)”.

extent, dominated groups. Nothing should be done to change this situation. Group-based inequality is justified by the dissemination and acceptance of the so-called hierarchy-enhancing legitimizing myths (HE-LM):

Hierarchy-enhancing legitimizing myths (HE-LMs) provide moral and intellectual justification for group-based oppression and inequality. Examples include myriad forms of racism, sexism, heterosexism, stereotypes, notions of “fate,” just world beliefs, nationalism, Confucianism, the doctrine of meritorious karma, classism, the Divine Rights of Kings, Manifest Destiny, and internal attributions for poverty. Such disparate myths have been used to argue that inequality is fair, legitimate, natural, or moral. Hierarchy-enhancing legitimizing myths not only organize individual, group, and institutional behavior in ways that sustain dominance, they often lead subordinates to collaborate with dominants in the maintenance of oppression (Pratto et al, 2006: 7).

Now, suppose that a member of some dominated group is affected by some public policy and decide to adopt a mobility-enhancing behavior, breaking with the behavioral prescription of her group. If categorization is essentially exogenous, she will still be seen as member of the group by the other members, and her attitude will influence them. Conversely, if categorization is predominantly endogenous, she may be seen as a “deserter” of the group and, in this case, her behavior will have meager or even null influence on other members of the group. Thus, endogeneity of categorization makes less likely that an idiosyncratic member of a subaltern group be followed by other members of the group.

3.3 The Model

The following model formalizes the points discussed above. Suppose there is a population divided in two social categories, the Blues and the Greens. The number of Blues is equal to B and the number of Greens is equal to G . These groups are defined through self-classification. This society is also characterized by group hierarchy, in such a way that the Blues are the dominant group and the Greens, the dominated one.

Individuals maximize a utility function by choosing a binary variable A , which can assume the value one (e.g., go to school) or zero (e.g., not go to school). This utility depends not just on the direct benefit generated by the

variable, but also on the choices made by the other members of the group. The maximization of the utility function yields the equation

$$A_i = \theta_i + \frac{1}{N-1} \sum_{j \in C(i), j \neq i} \gamma_j A_j, \quad N = B, G \quad (3.1)$$

The parameter θ_i is defined as $\sum_k \beta_k X_k^i + \varepsilon_i$, where X_k^i is the value of attribute k for person i , β_k is the direct impact of X_k^i on A_i and ε_i is a person-specific random effect. $C(i)$ is the social category to which individual i belongs and γ_j captures the neighborhood effect, there is, is the impact of A_j on A_i .

Groups have behavioral prescriptions attached to them. As the Blues are the dominant group, they are associated with the choice $A = 1$. Conversely, the ideal Blue is suppose to choose $A = 0$. If a self-classified member of some group is following the behavioral prescription associated with that group, she is classified by others as a member of such group. Otherwise, she is seen as a member of the other group with probability α , which is the degree of endogeneity of the categorization. The values of α range between zero and $\frac{1}{2}$. If endogeneity is equal to zero, there is no mismatch between self- and heterocategorization. If endogeneity reaches its maximum value, idiosyncratic individuals are randomly classified by others in anyone of the two groups.

The influence of j on i is greater if i see j as a member of her group. The neighborhood effect of j on i is equal to a parameter γ , whose values are between zero and one, times the probability of j be seen by i as a member of her own group. Thus, (3.1) can be rewritten as

$$A_i = \theta_i + \frac{\gamma}{B-1} \sum_{j \in C(i), j \neq i} A_j = \theta_i + \gamma \bar{A}_{j \neq i} \quad (3.2)$$

if i belongs to the Blue group or

$$A_i = \theta_i + \frac{\gamma(1-\alpha)}{G-1} \sum_{j \in C(i), j \neq i} A_j = \theta_i + \gamma(1-\alpha) \bar{A}_{j \neq i} \quad (3.3)$$

in case i belongs to the Green group. Let us call $\gamma_B = \gamma$ the intra-group neighborhood effect of the dominant group and $\gamma_G = \gamma(1-\alpha)$ the intra-group neighborhood effect of the dominated group. Thus, if categorization is essentially endogenous, dominant groups are supposed to present intra-group neighborhood effects higher than those regarding dominated groups. On the other hand, if endogeneity of categorization is negligible, both groups are supposed to

present similar levels of intra-group neighborhood effects.

3.3.1 Measuring neighborhood effects: the social multiplier methodology

In order to empirically estimate the neighborhood effect, it is necessary to solve the identification problem which naturally arises in the neighborhood effects models based on the linear-in-means principle. According to Manski (1993), there are three possible explanations for the fact that individuals of the same group tend to behave similarly:

- (a) endogenous effects, wherein the propensity of an individual to behave in some way varies with the behaviour of the group;
- (b) exogenous (contextual) effects, wherein the propensity of an individual to behave in some way varies with the exogenous characteristics of the group, and
- (c) correlated effects, wherein individuals in the same group tend to behave similarly because they have similar individual characteristics or face similar institutional environments (Manski, 1993: 532-533).

In Manski's terminology, endogenous effects are the neighborhood effects – they occur when, say, individual educational achievement tends to vary with the average educational achievement of some reference group (classmates, ethnic group etc). There are exogenous or contextual effects when individual achievement varies with, for instance, the socio-economic composition of the reference group. Finally, correlated effects happen if students of the same school tend to present the same achievement because, for example, they are taught by the same teachers (Manski, 1993: 533). In linear-in-means models, the average behavior of the group is affected by individual behavior. This is the so-called “reflection problem” — in this case, endogenous effects cannot be distinguished from exogenous or correlated effects. The social multiplier methodology, developed by Glaeser et al (2002), surmounts this identification problem. Consider this variation of (3.1):

$$A_i = \theta_i + \frac{\gamma}{N-1} \sum_{j \in C(i), j \neq i} A_j \quad (3.4)$$

Equation (3.4) is identical to the expression presented in Glaeser et al (2002: 5). Let us make an additional assumption regarding the attributes. Suppose

X_k^i is equal to $\bar{X}_k + \mu_k^i$, where \bar{X}_k is the group level average of X_k and μ_k^i is an specific individual component, independent across people. This assumption is important to correct the bias in the neighborhood effects due to sorting on observables. Considering the definition of θ_i , algebraic manipulation can show that

$$\frac{1}{N} \sum_{j \in C(i)} A_j = \frac{1}{1-\gamma} \frac{1}{N} \sum_{j \in C(i)} \theta_j \quad (3.5)$$

$$A_i = \theta_i \left(1 + \frac{\gamma^2 + \sigma\gamma(1-\gamma)(N-1)}{(1-\gamma)(N-1+\gamma)} \right) + \frac{\gamma}{N-1+\gamma} \sum_{j \in C(i), j \neq i} \theta_j \quad (3.6)$$

where $\sigma = \frac{Var(\bar{X}_k)}{Var(X_k^i)}$ captures the share of the variation in X_k which is due to the group level component. The premise of the social multiplier is that the presence of neighborhood effects generates externalities in such a way that the group level effect of some variable on some action is stronger than the individual level effect. For instance, some public policy regarding schooling has a given, positive effect on the school attainment chosen by some individual. If neighborhood effects are sufficiently strong, this effect is higher on the group level, as any individual, increasing her level of school attainment, influences their peers of doing the same.

Thus, the social multiplier is defined as the ratio of the group level coefficient to the individual level coefficient. Regressing A_i on X_i , we have a coefficient estimate equal to

$$\beta_k \left(1 + \frac{\gamma^2 + \sigma\gamma(1-\gamma)(N-1)}{(1-\gamma)(N-1+\gamma)} \right) \quad (3.7)$$

On the other hand, when the average A of group G is regressed on the average X of group G, it yields a coefficient estimate of $\frac{\beta_k}{1-\gamma}$. Dividing this value by 3.7, we arrive to the social multiplier, which is equal to

$$SM = \frac{N-1+\gamma}{(1-\gamma)(N-1)(1+\sigma\gamma) + \gamma} \quad (3.8)$$

Thus, if sorting is not taken into consideration, the estimated social multiplier is higher than the real one. Indeed, a high social multiplier can reflect the fact that individuals are sorted according to some attribute. However, it is

important to stress that the estimated social multiplier still overstates the true one due to sorting on unobservables.

3.4 Data and estimation

The model just presented suggests that, if categorization is essentially endogenous, dominated groups are supposed to present neighborhood effects smaller than those concerning dominant groups when a pro-mobility action is being considered.

In order to test this hypothesis, it will be used data from the 2000 Census of the Metropolitan Region of São Paulo (MRSP), Brazil. This country is suitable to this kind of analysis, as race is highly endogenous in this society. Moreover, MRSP is the largest metropolitan region in Brazil, being very representative of the country, as it nestles migrants from all regions of the country.

The sample is formed by 15-17 year-old teenagers. Individuals self-classified as “yellow”,⁴ indigenous or with undetermined race were excluded. The final sample is composed by 102,119 individuals (Table 3.1). The individuals were grouped according to two categorizations: gender and race. These two categorizations present degrees of endogeneity which are naturally distinct, being the former more exogenous than the latter. According to the gender categorization, individuals were divided in males and females, and according to racial categorization they were divided in whites and afro-descendents.⁵ While the sample is roughly equally divided between males and females, 64% of individuals are whites.

The following regression was run:

$$ATT_i = \beta_1 AGE_i + \beta_2 FEM_i + \beta_3 WHI_i + \beta_4 SON_i + \beta_5 SCH_i + \beta_6 PCI_i + \varepsilon_i \quad (3.9)$$

For simplification, a linear probability model was chosen.⁶ ATT , the dependent variable, takes the value 1 if the individual is attending school, being zero otherwise. Nearly 84% of individuals are attending school, being this rate smaller among non-whites and females (Table 3.1). AGE is age in years. FEM

⁴In Brazil, this category is used to identify those originated from Asiatic countries (mainly Japan).

⁵This category is formed by those self-classified as black or “pardo”.

⁶There is no loss with this choice. The linear probability results do not differ from the probit results (qualitatively) without instrumentation (Cutler & Glaeser, 1997).

is a dummy variable equal to 1 if the individual is female. WHI is equal to 1 if the individual is self-classified white. SON is equal to 1 if the individual is son/daughter of the head of the dwelling. SCH is years of effective schooling of the head of the dwelling. PCI is the logarithm of the per capita income of the individuals' dwelling. Finally, ε_i is the usual individual error term.

First, (3.9) is run on the individual level, separately for each category. Then, it is run on the group level: the variables take the value of the average in the sub-district (SD). The MRSP is divided in 157 SDs. Again, it is done separately for each category. Dividing the SD level coefficient by the individual level coefficient, we reach the social multiplier. Following Glaeser et al (2002), N will be defined as the average number of members of the category per SD. The parameter σ for each variable/category was calculated by dividing the variance of SD averages by the individual variance (Table 3.6). Substituting all these elements in (3.8), the neighborhood effect parameter is estimated.

The results are presented in Tables 3.2-3.5. On the individual level, all coefficients are significant and have the expected sign. Observing the group level coefficients, it is possible to see that per capita income does not engender any social multiplier (the group level coefficient is not greater than the individual level coefficient), bringing no evidence of a positive neighborhood effect. It is interesting to note that, regarding race, whites are more likely to attend school, but SDs with more whites present a higher fraction of out-of-school individuals (Tables 3.4-3.5). This phenomenon is known as aggregation reversal (Glaeser & Sacerdote, 2007). The same occurs with women and per capita income when just whites are taken into consideration.

In the case of whites, evidence of a considerable social multiplier and neighborhood effect is brought by the variables AGE, SCH and SON. On the other hand, for non-whites, it occurs just with the variable SON, being this estimated neighborhood effect inferior to that estimated for whites. Thus, neighborhood effects are clearly stronger for whites than for non-whites. When the gender categories are considered, there is no evidence that neighborhood effects are stronger for some group than for the other: estimated neighborhood effect entailed by AGE is slightly greater for men, whereas those engendered by SON and SCH are higher for women (although this last one is not significant at 5%).

3.5 Concluding remarks

This paper raises the hypothesis that the endogeneity of categorization poses a challenge to the fight against group inequality. It comes through the weakening of neighborhood effects for dominated groups. In highly endogenous categorizations, members of dominated categories adopting a pro-mobility behavior – and, thus, departing from the group’s behavioral prescriptions – can no longer be seen as members of the group, and their idiosyncratic behavior will not be followed by other members of the category. Thus, if categorization is essentially endogenous, neighborhood effects regarding a pro-mobility action between members of dominated groups are weaker than those for members of dominant groups.

This hypothesis is empirically tested. The utilized data is the 2000 Census from the Metropolitan Region of São Paulo, Brazil. It was estimated the neighborhood effect for 15-17 year-old teenagers regarding the decision of attending school or not. The individuals were grouped according to two categorizations (gender and race) in two groups (males and females; whites and non-whites).

The results corroborate the above mentioned hypothesis. When the exogenous categorization (gender) is considered, there is no evidence that the neighborhood effects among members of the dominated group – females – are weaker than those for the dominant group. On the other hand, when the endogenous categorization is considered (race), the estimated neighborhood effects for the dominated group (afro-descendants) show to be smaller than those for the dominant group (whites).

These results bring additional implications for public policy. In the presence of neighborhood effects, antipoverty policies would be more efficient, for example, if resources were concentrated in more interacting individuals (Durlauf, 2000). Nonetheless, as already heralded by the current literature, neighborhood effects go beyond physical proximity and depends on identity ties. The novelty of this paper consists in suggesting that neighborhood effects are stronger when such ties are rooted in exogenous elements. If groups are exogenously defined, identity links among their members are not broken by changing in the behavior. If the insights presented in this study are correct, it is true, for example, that affirmative action policies are more efficient in more exogenous racial categorization contexts.

Table 3.1: *Basic sample characteristics*

Information	Males	Females	Whites	Non- whites	Total
N. of observations	50,480	51,639	64,969	37,150	102,119
Average n. of observations per SD	321.53	328.91	413.82	236.62	650.44
Minimum n. of observations per SD	11	8	13	5	19
Maximum n. of observations per SD	1,977	2,051	2,655	1,373	4,028
% attending school	84.79	83.79	86.33	80.69	84.28

Table 3.2: *Regression results, social multiplier and neighborhood effects - Whites*

Variables	Individual coef.	SD coef.	SM	γ
AGE	0.016863 (0.0005144)	0.022450 (0.0092714)	1.33	0.25
FEM	0.013195 (0.0026356)	-0.049495 (0.0765696)	-3.75	(*)
SCH	0.003401 (0.0003601)	0.014139 (0.0067499)	4.16	0.81
SON	0.267199 (0.0041345)	0.530048 (0.0920754)	1.98	0.50
PCI	0.057806 (0.0015573)	-0.008042 (0.0272835)	-0.14	(*)

Obs.: Standard-errors are between parentheses.

(*): There is not a γ between zero and one which is solution to equation 3.8.

Table 3.3: *Regression results, social multiplier and neighborhood effects - Non-whites*

Variabes	Individual coef.	SD coef.	SM	γ
AGE	0,010716 (0,00082)	0,010465 (0,0101707)	0.98	(*)
FEM	0,022049 (0,004072)	0,020440 (0,0832142)	0.93	(*)
SCH	0,004650 (0,0006191)	0,002255 (0,0089187)	0.49	(*)
SON	0,291622 (0,0057292)	0,403055 (0,0751425)	1.38	0.29
PCI	0,069739 (0,0025551)	0,053120 (0,0319741)	0.76	(*)

Obs.: Standard-errors are between parentheses.

(*): There is not a γ between zero and one which is solution to equation 3.8.

Table 3.4: *Regression results, social multiplier and neighborhood effects - Males*

Variabes	Individual coef.	SD coef.	SM	γ
AGE	0.019275 (0.0006266)	0.035861 (0.0089826)	1.86	0.46
WHI	0.017100 (0.0034959)	-0.025628 (0.0406488)	-1.50	(*)
SON	0.187203 (0.0054582)	0.179081 (0.1023189)	0.96	(*)
SCH	0.004654 (0.0004509)	0.013379 (0.0062437)	2.87	0.71
PCI	0.060435 (0.0019347)	0.007645 (0.0254081)	0.13	(*)

Obs.: Standard-errors are between parentheses.

(*): There is not a γ between zero and one which is solution to equation 3.8.

Table 3.5: *Regression results, social multiplier and neighborhood effects - Females*

Variables	Individual coef.	SD coef.	SM	γ
AGE	0.013547 (0.0005682)	0.024241 (0.0095173)	1.79	0.44
WHI	0.011072 (0.0033917)	-0.158900 (0.0451489)	-14.35	(*)
SON	0.331293 (0.0042399)	0.438097 (0.0857114)	1.32	0.25
SCH	0.002390 (0.0004344)	0.015918 (0.0082011)	6.66	0.88
PCI	0.059169 (0.0018609)	0.014520 (0.0316694)	0.25	(*)

Obs.: Standard-errors are between parentheses.

(*): There is not a γ between zero and one which is solution to equation 3.8.

Table 3.6: *Individual and group level component of variation of observables*

Group	Variable	$Var(X_k^i)$	$Var(\bar{X}_k)$	σ
White	AGE	0.67	0.01	0.01
	FEM	0.25	0.00	0.01
	SCH	19.94	5.88	0.29
	SON	0.10	0.00	0.02
	PCI	1.02	0.34	0.33
Non-white	AGE	0.67	0.03	0.05
	FEM	0.25	0.01	0.06
	SCH	12.12	2.58	0.21
	SON	0.12	0.01	0.09
	PCI	0.68	0.18	0.26
Males	AGE	0.68	0.01	0.02
	WHI	0.23	0.03	0.12
	SON	0.09	0.00	0.03
	SCH	18.48	5.91	0.32
	PCI	0.98	0.35	0.35
Females	AGE	0.67	0.01	0.02
	WHI	0.23	0.02	0.11
	SON	0.13	0.00	0.03
	SCH	18.09	5.53	0.31
	PCI	0.97	0.35	0.36

Conclusion

The core hypothesis of this dissertation – the amplification of group-oriented policies engendered by neighborhood effects is weakened by the endogeneity of categorization – was underpinned by its three papers. This support assumed both a theoretical and an empirical nature. In paper 1, it was shown how it can occur from a social concept of neighborhood. If categorization is endogenous, members of dominated groups may exclude from their reference group people adopting a pro-mobility behavior. It reduces the observed human capital accumulated in their reference group, hence they will have less incentive in accumulating human capital. It can also happen in a physical sense of neighborhood (paper 2). When categorization is strongly influenced by endogenous elements, interactions will be drawn essentially by behavioral traits: (non) educated individuals will interact mainly with (non) educated individuals. As this effect extends also to one's offspring, it jeopardizes the educational mobility of disadvantaged groups. Finally, using a concept of neighborhood which is both physical and social, paper 3 empirically corroborates this hypothesis. Used data refers to the Metropolitan Region of São Paulo (Brazil). Estimated neighborhood effects are notably higher for the dominant group when the endogenous categorization (race) is adopted. On the other hand, this is not the case when the exogenous categorization (gender) is taken into consideration.

It is important to stress that the idea which is being defended here is not that endogeneity of categorizations weakens neighborhood effects in any situation. I am suggesting here that it happens when neighborhood effects concern a dominated group and a pro-mobility action. When one of these conditions is not met, the result can be the opposite. For instance, if a member of a dominated group decides to drop out of school, he is reinforcing his membership in the group by complying with the category's behavioral prescription. In this case, the endogeneity of the categorization will strengthen the neighborhood

effect. Furthermore, an endogenous categorization can weaken neighborhood effects under other circumstances – when, for instance, a member of a dominant group adopts an anti-mobility behavior.

It has strong implications regarding policies fighting group inequality. As already stressed by the literature, neighborhood effects are affected by identity, as it directly shapes social neighborhoods – as in paper 1 – and, once interactions are endogenous, it influences the formation of physical neighborhoods – as in paper 2. Here, I suggest that identity ties – and, hence, the neighborhood effects engendered by them – are stronger when they rest upon exogenous elements. When they are rooted in endogenous elements, they can be broken by changes in group members' behavior. Thus, group-oriented policies would be more efficient when driven to categories formed along exogenous lines, as in this case they would engender stronger neighborhood effects. Racial policies, for example, would be more efficient in segregated societies, as integration increases racial endogeneity.

An interesting extension of this study would be the analysis of how public policies can enhance this negative influence of categorization endogeneity on neighborhood effects by strengthening negative stereotypes. The weakening of neighborhood effects among members of dominated groups brought by endogenous categorization occurs because these categories are assigned to anti-mobility behavior. Let us use the distinction between two kinds of affirmative action policies made by Durlauf (2000): demand-side policies, which represent efforts to change the demand for employees and students by employers and colleges (as in the form of quotas), and supply-side policies, which are designed to change the characteristics of employees and students, making them more attractive to employers and colleges. Similar distinction is made by Loury (2000) between preferential and developmental affirmative action. There is evidence that the first type of affirmative action policies can strengthen the association of discriminated groups with negative stereotypes – college quota, for instance, can suggest that benefited groups need this kind of help because they are naturally unqualified – as well as increase the hostility against them. Thus, the second kind of affirmative action is recommended, particularly in endogenous categorization contexts, as they would avoid or diminish the weakening of neighborhood effects brought by the endogeneity of categorization.

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