The Evolution of Preferences in Political Institutions

Jiabin Wu *

Department of Economics

University of Wisconsin-Madison

Abstract

This paper argues that the evolution of preferences can serve as an important channel through which different political institutions affect economic outcomes in different societies. We develop a framework in which a majority preference group and an alternative preference group interact in the context of a political institution that determines the allocation of positions in the social hierarchy. The allocation of positions determines economic outcomes, indirectly affecting the intergenerational transmission of preferences and the corresponding long run economic trajectory of a society. We employ this framework to study how conducive different political institutions are to spreading preferences that induce efficiency. We find that, at least locally, any preference can be prevalent under "exclusive" political institutions. Therefore, a society can be trapped in a state in which preferences associated with unfavorable economic outcomes persist. On the other hand, preference evolution under "inclusive" political institutions has strong selection power and only preferences that locally have a comparative advantage in holding a high position can be prevalent. We further employ this framework to study the local segregation decisions by the alternative preference group and explore the political determinants of the phenomena of middleman minorities, ethnic enclaves and cultural heterogeneity.

Keywords: Preference evolution, Political institutions, Cultural transmission.

JEL Code: C73, D72.

---

*Address: 1180 Observatory Drive, Madison, WI 53706-1393, United States. Email: *jwu32@wisc.edu*. The author is indebted to William Sandholm for his continuous support, guidance and encouragement. The author is grateful to Kyung Hwan Baik, Alberto Bisin, Steven Durlauf, Richard Lotspeich, Manuel Mueller-Frank, Daniel Quint, David Rahman, Marzena Rostek, Antonio Penta, Ricardo Serrano-Padial, Aldo Rustichini, Eran Shmaya, Lones Smith, Bruno Strulovici, Matthijs Van Veelen, Marek Weretka for their advice and suggestions. The author also thanks participants from 2012 Midwest Workshop on Control and Game theory, 2012 Midwest Economic Theory Meeting, 2013 Midwest Economic Association Annual Meeting, 2013 Western Economic Association Annual Meeting and 2013 Theory Workshop in UW-Madison for their useful comments.

"It is always necessary to examine the possible bearing of deep-rooted social and economic changes upon the nature of the values held by the members of a given stratum or society."

—— Max Weber (1896)

1 Introduction

Political institutions provide the platforms and rules for people to interact with each other to determine the allocation of what is scarce: financial and natural resources, better facilities and services, access to advanced technology. Most notably, people compete for high positions in the social hierarchy. Society generally have many different social positions. Some (the high positions) are granted with power and privilege and linked to leadership roles (e.g. those of a civil servant or entrepreneur), while others (the low positions) are not. Guilds in the Middle Ages serve as a good historical example of a source of high positions in the social hierarchy. At the time, the guilds enjoyed certain privileges granted by the king or the state and had strong control over the urban economy.[1] Civil positions in Ancient China are another examples as they were usually linked with land and wealth.[2] In today's society, higher education and professional degrees are often associated with high positions in the social hierarchy since most occupations corresponding to favorable economic outcomes require such degrees.

The allocation of positions in the social hierarchy is important in determining the economic outcome of a society. Individuals with different positions interact with each other. They make decisions based on their own and others' positions and preferences. Such interaction between positions and preferences may be crucial for technology advancement or the emergence of more efficient economic institutions because certain preferences encourage cooperation and hard work, while others fail to do so.[3]

[1] See Acemoglu and Robinson (2012).

[2] The main channel for Chinese citizens to achieve these positions was the imperial exam, which tested knowledge of Confucian morals.

[3] For example, as argued by Weber (1930), the "Spirit of Capitalism", including hard work, prudence and frugality for both entrepreneurs and laborers is the key to the rise of modern enterprises. Akerlof (1982) pioneers the study of gift exchange and labor contracts and argues that labor workers' preferences for fairness should be taken into consideration to induce more efficient production. Recent work in experimental economics such as Fehr, Klein and Schmidt (2007) demonstrates that inequality aversion can lead to an informal contract between the employer and the employee enhancing productivity more than a formal contract. Francois and Zabojnik (2005) analyze the role of trustworthiness in economic development. They argue that whether new technology can be adopted and spread depends on whether firm owners can trust contractors.

Political institutions also indirectly affect the evolution of preferences across generations, since the economic success associated with a certain preference trait affects the transmission of this preference trait from one generation to the next. In some cases, immigrants may exert less effort in influencing their children to embrace their own lifestyle when observing that the members of the majority group have higher chances to obtain high positions in the social hierarchy. For example, "Americanization" policy in the early 20th Century effectively induced cultural integration in the United States.[4] On the other hand, immigrants' values may spread through the whole society because they instead enjoy higher economic success given their better opportunity to access high positions. Chinese minorities in South-East Asia serve as good examples.[5]

Therefore, it is crucial to consider how preferences evolve under different political institutions, so one can make better predictions about the economic trajectory of a society. However, the existing literature lacks an analytical framework for studying this issue systematically.[6]

In this paper, we develop a framework to study how political institutions affect economic outcomes through the channel of preference evolution. Consider a population consisting of a majority preference group in which agents share a certain preference trait and an alternative preference group in which agents share another preference trait. We emphasize that the two groups are defined by their preference traits rather than their ancestry. Therefore, a majority preference group member can be born in an alternative preference group family.[7] Assume that there are two types of positions

[4] See Kuran and Sandholm (2008). We further discuss the connection between our model and the phenomenon of "Americanization" in Section 5.

[5] See Landes (1998) for a discussion. As he states, "the same value thwarted by "bad government" at home can find opportunity else where, as in the case of China."

[6] A large body of research is devoted to assessing the role of political institutions in economic performance. For example, North and Tomas (1973), Olson (1982), North (1990), Acemoglu, Johnson and Robinson (2001, 2002), Persson and Tabellini (2003), Besley and Persson (2011), Acemoglu and Robinson (2012). However, most work in this literature starts from the basic assumption that preferences of the members of a society are fixed and exogenously given. Their analyses mainly focus on the direct effects of different political institutions on economic performance given such an assumption.

[7] The existence of the alternative preference group may be due to forces such as immigration, invasion and cultural importation. Recent literature shows that different religions and ethnicities shape individuals' economic preference traits such as work ethic and trust with ensuring ramification in the labor market (see Guiso, Sapienza and Zingales (2006) and McCleary and Barro (2006) for a discussion). Roemer (2006) also points out that political parties frequently represent different ethnic or religious interest groups, or groups that have different views on economic concerns or social issues such as racial integration or abortion. Therefore, if we divide the population into groups by religions and ethnicities, we can have an approximate division of the population by preferences. However, it is not necessary. As argued by Congleton (2011), many interest groups can be organized by the members' cultural traits

in the social hierarchy: high and low. In each generation, the allocation of high positions among the population is determined by interactions between political representatives of the two groups in the political institution.[8]

All agents then enter an exogenous assortative matching process that pairs each high position holder with a low position holder to engage in identical pairwise economic activity. The assortative matching process in this paper is close to Alger and Weibull (2012, 2013), but is essentially different from their work. We consider asymmetric interactions with different roles which are linked to positions in the social hierarchy, while they consider symmetric pairwise interactions in which the roles of the two players are identical. Therefore, in our context, how the allocation of high positions is determined in the political institution plays an important role in determining the outcome of the matching process.

After the economic outcomes of the agents in one generation are realized, a new generation of agents is born. Each agent has one child who is born without preferences. We develop a cultural transmission mechanism based on Bisin and Verdier (2001b): an agent exerts effort to inculcate his own preference into his child when he thinks that his own preference group is doing better economically than the other group; meanwhile, the child may be influenced by other individuals in society. By specifying both intra-generational and inter-generational activities, we derive an explicit dynamic describing preference evolution.

Given this dynamic, we seek to answer two questions. First, we examine how conducive different political institutions are to spreading preferences that induce efficiency. We employ the concept of locally evolutionarily stable preference (LESP) to study whether a small change in the distribution of preferences (a small alternative preference group emerges), can create a new thriving preference trait or merely one that is quickly assimilated in the society. In other words, we are interested in finding which political institutions can encourage productivity and economic efficiency given this small change. Second, we look at the local segregation problem of the alternative preference group and study how local segregation affects productivity in a society. This question is closely related to the phenomena of middleman minorities and ethnic enclaves in which certain immigrant groups establish closely connected ethnic business networks and enclave labor markets. For example, looking back at the immigrations throughout the United States history, certain ethnic groups, such

such as preferences, norms and ideologies. These groups include members with different occupations and incomes and may have considerable influence on political decision making.

[8]Note that the political representatives for a group are not necessarily members of that group. We emphasize that what matters is that the members from each group are acting as a voting bloc.

as Asian and Jewish groups, had strong economic performance and have been able to preserve their own cultural identities even when they were under-represented in politics, while other groups have not.[9] Therefore, it is crucial to pinpoint the underlying political determinants of immigrant groups' local segregation decisions so that one can better understand cultural heterogeneity and how immigrant groups contribute to the economy in the host country.

We start by answering the first question. Recent works including Besley and Persson (2011) and Acemoglu and Robinson (2012) emphasize the importance of the distribution of political powers, particularly the ability of different groups to pursue their objectives, on the economic consequences of different societies. They define a political institution in which control rights are constrained by the preferences of the population as an "inclusive" (or "cohesive") political institution with checks and balances. In other words, inclusiveness of a political institution is measured by the rents that one group willingly shares with the other group. In this paper, we follows a similar spirit and consider a range of political institutions indexed by the degrees of inclusiveness. We call a political institution more "exclusive" if the alternative preference group is excluded from high positions or faces high barriers to acquire high positions. For example, majority voting may be considered as an example of exclusive political institution. On the other hand, we call a political institution more "inclusive" if the political representatives from the two groups interact more equally to determine the allocation of high positions. For example, proportional representation with strong constitutional checks and balances may be considered as an inclusive political institution.[10]

We first look at an exclusive political institution. We assume that the majority has the exclusive right to determine the allocation of positions in the social hierarchy. We call this political institution "majoritarianism". We show that any preference can be locally stable under this exclusive political institution since the majority is able to obtain more high positions through its political power. Hence, poor economic performance may persist because the political institution is able to lock a society into a state populated with agents with preferences associated with unfavorable economic outcomes. Preferences which may lead to favorable economic outcomes fail to spread in such a society because an alternative preference group with such a preference lacks the political power to obtain sufficiently many high positions to achieve economic success.

We then look at an inclusive political institution, in which political representatives from the

[9] See a discussion in Hirschman and Wong (1986).

[10] Note that exclusive political institutions defined in our model are different from extractive political institutions defined in Acemoglu and Robinson (2012), in which control rights are given to a small group of elites. In this paper, we do not discuss extractive political institutions.

two groups negotiate on the allocation of high positions. We model the negotiation as a Nash bargaining problem, assuming that the bargaining powers of the two groups are proportional to their group sizes. We call this an egalitarian representative democracy, since the bargaining power of each group exactly reflects the number of voters from the group. In other words, this political institution promotes "equality of opportunities".[11] This political institution represents the common form of proportional representational democracy. We find that such a political institution responds to the two groups' incentives of getting more high positions, because the allocation of high positions between the two groups is determined by the comparison of the marginal benefits of getting more high positions for each group. When the majority preference group marginally benefits more from getting high positions than the alternative preference group, the majority preference group obtains sufficiently many high positions to achieve an average economic outcome that is higher than the alternative preference group. This enables the majority's preference to assimilate the alternative preference group's preference through preference evolution. In fact, we prove that only preferences that locally have a comparative advantage in holding a high position can be locally stable.

To better understand the economic consequences of this result, consider a case in which the pairwise interaction specifies a contractual relationship between a boss (high position) and a worker (low position), who form a firm that yields a certain economic outcome. Recall that when the marginal benefit for a majority group member to have the high position is higher than that for an alternative preference group member, the majority's preference would be prevalent in this political institution. More importantly, it also implies that the majority group's preference actually "suits" the high position better than the alternative preference group's preference, since a firm with a majority group boss and an alternative preference group worker generates larger economic surplus than a firm with a alternative preference group boss and a majority group worker. Therefore, the result can be reinterpreted as only preferences that locally have the biggest comparative advantage in being a boss instead of being a worker can prevail. This criterion of local stability is related to productivity. However, it does not imply that preferences that induce the highest average payoff for the whole society can always be prevalent. Therefore, the relationship between political institutions and efficiency is subtle. We provide a further discussion in Section 5.1.

Furthermore, we generalize our analysis to allow for an uneven distribution of bargaining powers between groups, representing the historical examples in which the alternative preference group faces voting restrictions or entry barriers to participating in politics. This political institution can

[11] We emphasize that "egalitarianism" in our model refers to "equality of opportunities" rather than "equality of outcomes".

be viewed as a convex combination of majoritarianism and egalitarian representative democracy, because the allocation of high positions between the two groups is determined both by comparison of the bargaining powers and the marginal benefits of getting more high positions for each group. We consider the political institution to be more inclusive when the majority's advantage in bargaining power is smaller and to be more exclusive when the majority's advantage in bargaining power is larger. We first show that even if the majority has a weak advantage in bargaining power, any preference of the majority can be locally stable. However, this does not necessarily imply that political institutions with different levels of inclusiveness have the same effect on preference evolution. We define the "assimilation set" of a preference trait, given a certain level of inclusiveness, as the largest set of alternative preference traits for the alternative preference group that the majority preference group with this preference can assimilate in the long run. We show that as a political institution becomes more inclusive, the assimilation set shrinks. Therefore, when the majority loses political power, it becomes harder for the majority's preference to assimilate the alternative preference group's preference. In other words, preference evolution has stronger selection power under more inclusive political institutions.

To understand the economic intuition behind this result, we consider again the example in which the pairwise interaction specifies a contractual relationship between a boss and a worker. We show that when a political institution becomes more exclusive, it becomes less important whether the majority's preference actually "suits" the high position better than the alternative group's preference. This bridges our conclusions drawn previously on majoritarianism and egalitarian representative democracy.

Next, we turn to the second question regarding the local segregation problem of the alternative preference group. We relax the assumption that the segregation of the labor market (assortativity of the matching) is exogenously given. We assume that political leaders from the alternative preference group can partially segregate the group within the labor market by promoting unique ethnic markers such as dialects and dress codes or relocating the group away from the majority so that the probability of matching with their own kind is higher. If the increase in self-matching can sufficiently raise the alternative preference group members' payoffs, the alternative preference group can resist assimilation pressure from the majority. We explore the alternative preference group's political leaders' underlying motivation of local segregation and show that different political institutions give them distinctly different reasons to do so. In more exclusive political institutions, local segregation purely serves as a self-defense mechanism for the alternative preference group to offset the political power of the majority. On the other hand, in more inclusive political institutions, the degree of local segregation affects the equilibrium allocation of high positions in political bargaining, so it is not necessarily the case that increasing local segregation is beneficial to the alternative preference group. Hence, the local segregation decision of the alternative preference group's political leaders heavily relies on the political institutions they face. We provide a further discussion of the aggregate effects of local segregation on economic performance under different political institutions in Section 5.2.

The paper is organized as follows. Section 2 lays out the model, which specifies the intra-generational activities, including pairwise interactions and the matching process, and the inter-generational activities. Section 3 develops our notions of evolutionarily stability and applies them to study the evolution of preferences in different political institutions. Section 4 studies the local segregation decision of the alternative preference group. Section 5 discusses the empirical relevance of our model and its predictions. Section 6 presents concluding remarks.

Related Literature

To employ the evolution of preferences as a channel to understand the impact of political institutions on economic performance, we adopt two main methodologies from the literature of preference evolution and cultural transmission.

Preference evolution is a way of studying the evolution of human behavior by using tools and concepts from evolutionary biology and evolutionary game theory. As opposed to evolutionary game theory, which treats the behaviors of human as the primary objects that evolve, preference evolution emphasizes that the primitives should instead be their underlining preferences. Works including Güth and Yaari (1992), Güth (1995), Bester and Güth (1998), McNamara, Gasson and Houston (1999), Ok and Vega-Redondo (2001), Dekel, Ely and Yilankaya (2007), Heifetz, Shannon and Spiegel (2007a, 2007b), Kuran and Sandholm (2008) and Akçay et al. (2009) contribute to the understanding of preference evolution. Note that Sethi and Somanathan (2001), Van Veelen (2006), Alger (2010) and Alger and Weibull (2010, 2012, 2013) study preference evolution with assortative matching as we consider in this paper. Note that there is a different stream of studies in preference evolution (see Robson (2001) and Robson and Samuelson (2011) for general surveys). These works treat natural selection as a metaphorical principal and the individuals as agents. Nature has a goal function, and endows agents with utility functions so that their induced behavior achieves Nature's goal. In these works, the matching process is missing or unimportant since individuals do not engage in strategic interactions, or are "playing the field".

Cultural transmission mechanisms were first formally modelled by Cavalli-Sforza and Feldman (1981) and Boyd and Richerson (1985) for the study of the detailed process of how preferences are transmitted across generations. Building on those works, Bisin and Verdier (2001b) introduce a model in which the probability that a child adopts a certain preference is endogenously determined by the parent's choices. The cultural transmission mechanism we adopt in this paper is inspired by Bisin and Verdier (2001b), but different in one crucial assumption. In their model, parents are assumed to use their own utility functions to evaluate the success of different preferences, and therefore have tendencies to transmit their own preferences to their children. In contrast, we assume that parents have knowledge of the economic outcomes corresponding to different preferences, and want their children to adopt the one that fits best at the time. Bisin and Verdier (2001a) call the assumption in their model "imperfect empathy" and the one in ours "perfect empathy". Since we aim to explore the unconfounded effect of different political institutions on preference evolution in this paper, we prefer the use of "perfect empathy". Extending our model by allowing "imperfect empathy" would be an interesting avenue for future study.

Some recent theoretical work on cultural transmission accounts for the effects of political institutions. Bisin and Verdier (2000b) study people's preferences for public good, in which the good is publicly provided by majority voting. They show that ideology may play an important role in shifting the voting results and the trajectory of preference evolution. Bisin and Verdier (2005) study the relationship between the transmission of work ethics and redistributive policies under majority rule. They suggest that welfare state policies may eliminate strong work ethics. Tabellini (2008a) studies the impact of external legal enforcement institutions determined by majority rule on the transmission of the internalized norm of good conduct. He shows that it is possible that legal enforcement may remain weak and individual values may discourage cooperation in the long run, given adverse initial conditions. Other works include Gradstein and Justman (2002, 2005) and Dixit (2009).[12] The critical difference between our paper and this research is that the primary aspect of political institutions we consider is that of determining the allocation of positions in the social hierarchy rather than fiscal policies or legal enforcement. Moreover, we systematically compare the effects of a range of different political institutions on the evolution of preferences.

In addition, an important recent literature documents the long-term persistence and long lasting

[12] Gradstein and Justman (2002, 2005) study the role of education in promoting unified culture within a society, in which different modes of centralized and decentralized schooling are determined by political interactions. Dixit (2009) studies the relation between education and pro-sociality, in which school financing is determined by majority voting.

effects of different social structures, including political institutions, on the transmission of preferences. Guiso, Sapienza and Zingales (2008) study how the constitutions of city states in medieval Italy influenced values such as trust. Tabellini (2008b), following Bainfield (1958), studies the long-term effects of literacy and other indicators of political institutions on individual values and beliefs, such as trust and respect for others, in Western countries between the 17th and 19th centuries. Durante (2009) studies the effects of historical institutions favoring cooperation and social insurance on trust in Europe. Ljunge (2010), following Bisin and Verdier (2005), studies the empirical relationship between the welfare state and work ethic. In our limited knowledge, there are no systematic empirical studies on how different political institutions affect preference evolution across time and societies. We hope that the model proposed in this paper may serve as a suitable framework for future research on this topic.

2 The Model

To establish an analytical framework for studying preference evolution across generations, we first specify intra-generational activities and inter-generational activities for the agents. Intra-generational activities determine the material payoffs for different agents within a generation given the distribution of the agents' preferences. The material payoffs determine the agents' choices for intergenerational activities, which in turn give rise to a distribution of preferences for the agents in the next generation. Figure 1 displays the details of the preference evolution process. The intra-generational activities consist of three components: 1) group level interactions in a political institution on determining the allocation of high positions in the social hierarchy, 2) Matching, 3) Pairwise interactions.

The population is divided into groups by preferences. In this paper, we focus on the case in which there are two preference groups in the population: a majority preference group and an alternative preference group. Assume that the social hierarchy consists of two types of positions: high and low. Note that the number of high positions available is fixed and less than the total mass of the population. In other words, a fixed proportion of the population is excluded from having such positions. In this model, we assume a mass $\frac{1}{2}$ of the positions are high positions and the remaining mass of $\frac{1}{2}$ are low positions since the agents later engage in pairwise interactions which involve exactly one agent with high position and the other with low position. Relaxing this assumption would be a possible extension of the model.[13]

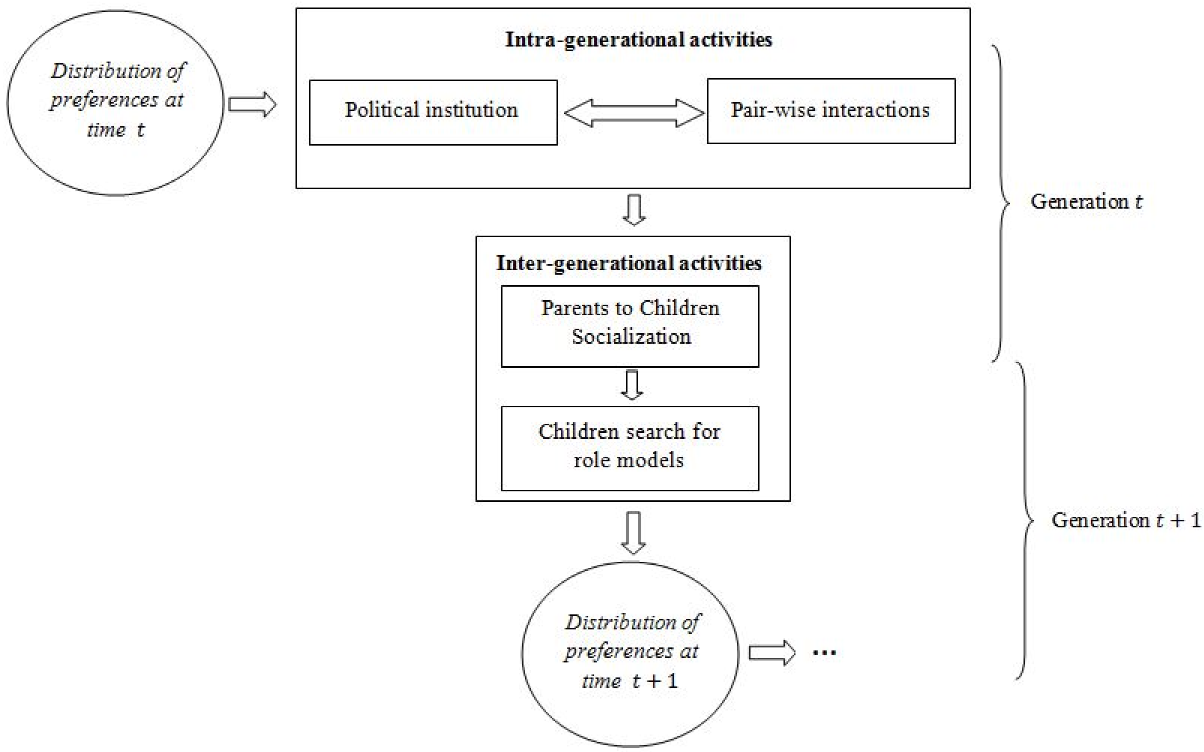

Figure 1

Assume that each group has political representatives who represent the common interests of their own group. Political representatives from both groups first engage in political institution to acquire the high positions because the larger share of high positions a group can get, the higher the expected material payoffs may be for the group members. After the acquisition of positions, each agent's position and his corresponding role in the subsequent pairwise interaction is determined. For example, an agent with high position will be the boss and an agent with low position will be the worker. All the workers (agents with low positions) then participate in a matching process to match with the bosses (agents with high positions) in the labor market. Finally, each pair of boss and worker (one with the high position and the other with the low position) engage in identical pairwise interactions (for example, they form farming cooperative to harvest crops or private firm to produce goods) to generate economic outcomes. Note that the expected economic outcomes of all the agents would be taken into consideration by the political representatives of the two groups

[13]For example, if the mass of high positions is less than $\frac{1}{2}$, one can study a context in which some agents are unmatched, or the agents instead engage in interactions with more than two players.

when they determine the equilibrium allocation of high positions. In addition, the bosses usually earn more than the workers and this is why the political representatives have incentives to acquire more high positions for their own groups through political institution in the first place.

After engaging in intra-generational activities, each member of the current generation bears one offspring. The children's preferences are malleable and the parents can choose how much effort to place in socializing their children to have the parent's preferences. The probability of successful indoctrination increases in the effort a parent exerts. However, if the socialization fails, the child searches in the society for a role model and adopts the preference of the role model.

2.1 Intra-Generational Interactions

This subsection describes two components of the intra-generational activities: pairwise interactions and the matching process. The allocation of high positions in the social hierarchy are assumed exogenously given in this section. How political representatives interact to determine such allocation in different political institutions is analyzed in Section 3.

2.1.1 Pairwise interactions

Consider a continuum of agents that constitutes a generation. Each agent carries a preference trait θ over a set of lotteries ΔO on a set of alternatives O. The set of potential preferences that agents can take is denoted as Θ, which is assumed to be a metrizable set. This set can include fundamental preferences or "character" traits such as time discounting, risk aversion, social preferences, work ethics, conscientiousness, perseverance, sociability, attention, self-regulation, self-esteem, the ability to defer gratification and the like.[14]

All the agents are matched in pairs to engage in certain identical pairwise interaction denoted by Γ. There are two roles in this interaction, h and l. For example, consider a pairwise contractual game involving one boss (role h) and one worker (role l). An agent with the high position takes the

[14]Many of these fundamental preferences studied in the literature are represented by some real parameters. For example, altruism can be represented by a single real parameter which denotes the degree of altruistic feeling a person attaching to others' payoffs. Similar examples include guilt aversion (Charness and Dufwenberg (2006)), morality (Alger and Weibull (2013)) and work ethics (Bisin and Verdier (2005)). On the other hand, inequality aversion (Fehr and Schmidt (1999)), CES model of both altruism and inequality aversion (Van Veelen (2006)) and quasi-hyperbolic discounting (Laibson (1997)) are usually characterized by two or more real parameters. In this paper, we do not restrict our attention only to preferences that can be represented by real parameters, but a more general set of preferences.

role of boss and an agent with the low position takes the role of worker. The boss offers a contract to the worker and the worker exert efforts to produce goods accordingly. Different preferences may affect the incentive schemes provided by the boss as well as the productivity of the worker. For example, if both the boss and the worker have certain social preferences, then the boss may reward the worker voluntarily and the worker may reciprocate by exerting more effort.[15]

Role h is equipped with strategy space S_h and role l is equipped with strategy space S_l. We allow that the agents matched in pairs may or may not have complete information about their opponents' preferences.[16]

Consider a pair of agents. One agent is with preference θ_1 and the other is with preference θ_2. Suppose θ_1 agent takes role h and θ_2 agent takes role l. Note that the role assignment for an agent is predetermined by political representatives' interactions taking place in the political institution and his opponent is determined by the matching process. The solution concept chosen depends on the game Γ these two agents play. However, to avoid equilibrium selection problem, we always assume that Γ has an unique equilibrium. Let $(s^*_{\theta_1}, s^*_{\theta_2}) \in S_h \times S_l$ denote the equilibrium strategy profile.

Let $\pi_h : S_h \times S_l \to \mathbf{R}$ denote the material payoff of the agent with role h and $\pi_l : S_l \times S_h \to \mathbf{R}$ denote the material payoff of the agent with role l. These material payoff functions are independent of the players' preferences. Let $V_h(\theta_1, \theta_2) = \pi_h(s^*_{\theta_1}, s^*_{\theta_2})$ denote the equilibrium material payoff of the θ_1 agent and $V_l(\theta_1, \theta_2) = \pi_l(s^*_{\theta_2}, s^*_{\theta_1})$ denote the equilibrium material payoff of θ_2 agent. Assume that V_h and V_l are continuous in both arguments. In addition, we impose the following assumption on the equilibrium material payoffs:

Assumption [A1] $V_h(\theta_1, \theta_2) > V_l(\theta_1, \theta_2)$, for any $\theta_1, \theta_2 \in \Theta$.

Assumption [A1] implies that playing role h is always better than playing role l (in terms of material payoffs) when two agents are matched in pair. The difference in material payoffs of the two roles provides potential incentives for the political representatives to acquire more high positions

[15]See Fehr, Klein and Schmidt (2007) for theory and experimental studies on behavioral contracts involving inequality aversion.

[16]As in Heifetz, Shannon and Spiegel (2007a, 2007b) and Dekel, Ely and Yilankaya (2007), one can assume that with probability $p \in [0, 1]$, an agent can observe the preference of his opponent matched in the same pair. Otherwise, he can only observe the statistical distribution of preferences in the population. $p = 1$ is the complete information case studied in Güth and Yaari (1992) and Güth (1995) and $p = 0$ is the case studied in Ok and Vega-Redondo (2001) and Alger and Weibull (2013).

for their own groups through the political institution.

2.1.2 The Matching Process

The previous section describes the pairwise interactions. Here we develop a matching process based on the one introduced by Alger and Weibull (2012), which specifies how the agents are matched in pairs.

We restrict our attentions to the case where only two preference traits $\theta, \theta' \in \Theta$ are presented in the population. Suppose that $1-\mu$ of the population have preference θ, $\mu < \frac{1}{2}$. These agents form a majority preference group. μ of the population have preference θ'. These agents form an alternative preference group.

Before introducing the matching process, two crucial quantities $k(\mu)$ and $\sigma(\mu)$ need to be emphasized. Recall that we assume there is a one-to-one relationship between role h and the high position in the social hierarchy. For illustration purpose, we use boss to represent role h and the high position, worker to represent role l and the low position hereafter in this section. Variable $k(\mu)$ describes the allocation of bosses and workers between the majority group and the alternative preference group. The parameter $\sigma(\mu)$ measures the degree of segregation of the matching market. These two quantities determine the outcome of the matching process, and ultimately the average material payoffs of the two groups. For now we assume that $k(\mu)$ and $\sigma(\mu)$ are exogenous. We illustrate how $k(\mu)$ is determined in different political institutions by the political representatives in Section 3. Moreover, we extend the model to allow $\sigma(\mu)$ to be endogenously determined by the alternative preference group in Section 4.

First, consider $k(\mu)$. Assume that $\frac{1-\mu}{2} + k(\mu)$ of the majority and $\frac{\mu}{2} - k(\mu)$ of the alternative preference group are bosses. One can see that the fraction of bosses and workers among the whole population are both exactly $\frac{1}{2}$ as is necessary for all agents to be matched in pairs. The range for $k(\mu)$ is $[-\frac{\mu}{2}, \frac{\mu}{2}]$, which ensures that neither the number of bosses nor the number of workers among the alternative preference group is negative. Figure 2 provides a graphic illustration of $k(\mu)$.

Note that $k(\mu) > 0$ implies that the fraction of bosses among the majority is more than 50 percent of its group size. Similarly, $k(\mu) < 0$ implies that the fraction of bosses among the alternative preference group is more than 50 percent of its group size.

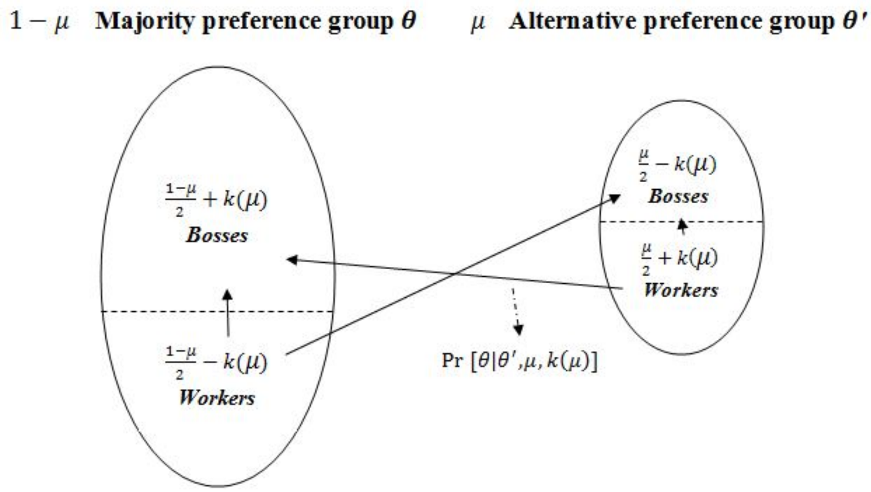

Figure 2

Next, we consider $\sigma(\mu)$. Let $\Pr[\theta_1|\theta_2,\mu,k(\mu)]$ denote the probability that a θ_2 worker is matched with a θ_1 boss, for any $\theta_1,\theta_2\in\Theta$. Let $\sigma(\mu)\in[-1,1]$ be the difference between the probability that a θ worker is matched with a θ boss and the probability that a θ' worker is matched with a θ boss:

$$\sigma(\mu)=\Pr[\theta|\theta,\mu,k(\mu)]-\Pr[\theta|\theta',\mu,k(\mu)]. \tag{1}$$

$\sigma(\mu)$ measures the degree of segregation in the matching market [17]. Segregation of matching market is commonly observed in the reality due to people's tendency to interact with people in the same geographical area or sharing similar arbitrary neutral ethnic markers such as dialects (See Boyd and Richerson (2005)). When $\sigma(\mu)=0$, the matching is uniformly random. When $\sigma(\mu)=1$, the two groups are completely segregated with each group of agents only matching with their own group members. For consistency, the following balancing condition needs to be satisfied:

$$(\frac{1-\mu}{2}-k(\mu))\Pr[\theta|\theta,\mu,k(\mu)]+(\frac{\mu}{2}+k(\mu))\Pr[\theta|\theta',\mu,k(\mu)]=\frac{1-\mu}{2}+k(\mu). \tag{2}$$

This condition states that the sum of workers from the majority who match with bosses from the majority and the workers from the alternative preference group who match with bosses from the majority is equal to the total number of bosses in the majority. Equations (1) and (2) together imply

$$\begin{aligned}\Pr[\theta|\theta,\mu,k(\mu)] &= 1-\mu+2k(\mu)+\sigma(\mu)(\mu+2k(\mu)), &(3)\\ \Pr[\theta|\theta',\mu,k(\mu)] &= 1-\mu+2k(\mu)-\sigma(\mu)(1-\mu-2k(\mu)). &(4)\end{aligned}$$

[17] Bergstrom (2003) develops the concept of *algebra of assortative encounters* for exogenous matching process which is exactly the one we define here.

Note that $\Pr[\theta'|\theta,\mu,k(\mu)] = 1-\Pr[\theta|\theta,\mu,k(\mu)]$ and $\Pr[\theta'|\theta',\mu,k(\mu)] = 1-\Pr[\theta|\theta',\mu,k(\mu)]$. Given the role assignment and the matching process, we can calculate the corresponding average material payoffs of each group. Define $F(\mu,\sigma(\mu),k(\mu))$ as the average material payoff of the majority, given the matching process:

$$\begin{aligned} F(\mu,\sigma(\mu),k(\mu)) \quad = \quad & \frac{1}{1-\mu}((\frac{1-\mu}{2} - k(\mu))\Pr[\theta|\theta,\mu,k(\mu)](V_h(\theta,\theta) + V_l(\theta,\theta)) \\ & +(\frac{\mu}{2} + k(\mu))\Pr[\theta|\theta',\mu,k(\mu)]V_h(\theta,\theta') \\ & +(\frac{1-\mu}{2} - k(\mu))\Pr[\theta'|\theta,\mu,k(\mu)]V_l(\theta',\theta)). \end{aligned} \tag{5}$$

Let us examine the components on the right hand side of equation (5). The number of workers from the majority is $(\frac{1-\mu}{2} - k(\mu))$ and $\Pr[\theta|\theta,\mu,k(\mu)]$ is the probability that a worker from the majority matches with a boss also from the majority. Hence, there are $2 \times (\frac{1-\mu}{2} - k(\mu))\Pr[\theta|\theta,\mu,k(\mu)]$ of majority members matched in pairs in expectation. $(\frac{\mu}{2} + k(\mu))$ is the number of workers from the alternative preference group, and $\Pr[\theta|\theta',\mu,k(\mu)]$ is the probability that worker from the alternative preference group matches with a boss from the majority. Hence, $(\frac{\mu}{2} + k(\mu))\Pr[\theta|\theta',\mu,k(\mu)]$ is the expected number of bosses from the majority who hire workers from the alternative preference group. $(\frac{1-\mu}{2} - k(\mu))$ is the number of workers from the majority, and $\Pr[\theta'|\theta,\mu,k(\mu)]$ is the probability that worker from the majority matches with boss from the alternative preference group. Hence, the expected number of workers from the majority that are employed by bosses from the alternative preference group is $(\frac{1-\mu}{2} - k(\mu))\Pr[\theta'|\theta,\mu,k(\mu)]$.

Similarly, define $G(\mu,\sigma(\mu),k(\mu))$ as the average material payoff of the alternative preference group given the matching process, we have,

$$\begin{aligned} G(\mu,\sigma(\mu),k(\mu)) \quad = \quad & \frac{1}{\mu}((\frac{\mu}{2} + k(\mu))\Pr[\theta'|\theta',\mu,k(\mu)](V_h(\theta',\theta') + V_l(\theta',\theta')) \\ & +(\frac{1-\mu}{2} - k(\mu))\Pr[\theta'|\theta,\mu,k(\mu)]V_h(\theta',\theta) \\ & +(\frac{\mu}{2} + k(\mu))\Pr[\theta|\theta',\mu,k(\mu)]V_l(\theta,\theta')). \end{aligned} \tag{6}$$

Notice that the matching process defined here is essentially different from the one in Alger and Weibull (2012). The matching process in Alger and Weibull (2012) is suitable for the situation in which agents are taking homogeneous roles, and consequentially does not have a role assignment mechanism as different political institutions we analyze in the Section 3. Hence, the average material payoffs they obtain do not involve $k(\mu)$.

As we will show in Section 2.2, the comparison between the average material payoffs $F(\mu,\sigma(\mu),k(\mu))$

and $G(\mu, \sigma(\mu), k(\mu))$ is crucial for driving preference evolution, since parents make their decisions on transmitting preferences to their children based on this comparison in the cultural transmission process.

2.2 Inter-Generational Cultural Transmission

In this section, we model the detail process of how preferences are transmitted across generation. Many important preferences are determined by an early imprinting. As argued by Heckman (2011), families play an essential role in shaping their children and the early years of a child's life before he enters school lay the foundations for all that follows, which is persistent through out his life. Besides parents' influence, children may also be affected by the society at large via imitation and learning from role models. Parents' direct influence is usually referred as vertical transmission and the social learning process is called oblique transmission.[18] Here we develop a cultural transmission mechanism based on Bisin and Verdier (2001b), which specify the details of these two type of acculturation processes.

Vertical transmission takes place within the family. Assume that preferences are not heritable, that is, the children are not born with any particular preference trait. In each family, the parent feels empathy towards his child: the parent is motivated to exert effort on influencing his child to adopt his own preference. Note that a parent can only instill his own preference into his child since it is hard for a parent to convince his child to adopt an alternative preference while he himself behaves in a different way. The probability a parent successfully inculcates his own preference into his child is increasing in his effort in influencing the child. When the parent fails to inculcate his own preference into his child, the child randomly draws an individual from the population as his role model and adopts the role model's preference.[19]

The two transmission processes are crucial for us to model how the distribution of preferences in the population shifts over time. If either vertical transmission or oblique transmission is missing, the distribution of preferences would be fixed across generation. To see why, suppose the parents never socialize their preferences to their children (no vertical transmission), then all the children have the same probability of meeting every members of the population. On the other hand, if the parents

[18] Cavalli-Sforza, Feldman (1981) introduce the formal definitions of vertical and oblique transmissions.

[19] A child may have tendency to imitate those who have the same preference as his parent since they share similar ethnic markers such as dressing codes and dialects. In other words, the "cultural" sample a child faces may not necessarily be the whole population. Nevertheless, as long as children from both groups have the same tendencies, the direction of cultural transmission on the population level would be the same.

always socialize their preferences to their children with probability 1 (no oblique transmission), the children always have their parents' preferences.

Assume that parents know the average material payoff corresponding to each preference[20] and they prefer their children to adopt the preference that maximizes the children's expected material payoffs.[21] This assumption and the empathetic attitude of the parents towards their children are together called *perfect empathy*. It captures the fact that preferences that are well aligned with economic interests are often culturally supported (See Congleton (2011)). Note that Bisin and Verdier (2001b) make an alternative assumption called *imperfect empathy*, that is, the parents do not use material payoffs as measures for making decisions but directly use their own utility functions to evaluate the equilibrium strategy profiles. They also use "cultural distaste" for describing such an assumption. The assumption of perfect empathy is preferred over imperfect empathy for our purpose in this paper because we try to study the unconfounded effect of political institutions on preference evolution.[22] Nevertheless, extending our model to allow for imperfect empathy may serve as an interesting future extension.

Assume that time is discrete. In generation t, the size of the majority group with preference trait θ is $1-\mu_t$, and the size of the alternative preference group with preference trait θ' is μ_t.

Let $d(\mu_t, x)$ denote the probability of successful vertical transmission. $d : [0,1] \times [0,\infty) \to [0,1]$ is continuous differentiable in x. Assume $\frac{\partial d(\mu_t,x)}{\partial x} > 0$: the probability of successful vertical transmission increases in parent's effort. In addition, assume $d(\mu_t, 0) = 0$, that is, when a parent exerts no effort, the vertical transmission fails with probability 1. Let $c : [0,\infty) \to [0,\infty)$ be the cost function for a parent. Assume that the cost function is identical for all parents and $c(0) = 0, c' > 0, c'' > 0$.

Define $P_t^{\theta\theta}(x) = d(\mu_t, x) + (1 - d(\mu_t, x))(1 - \mu_t)$, which is the probability that a child from a majority family adopts the preference of his parent's group. $(1 - d(\mu_t, x))(1 - \mu_t)$ is the probability that a parent fails to inculcate his child with his own preference, but his child ends up finding a role model with the same preference as his own. Define $P_t^{\theta\theta'}(x) = (1 - d(\mu_t, x))\mu_t$, which is the

[20]The parents may acquire this information through news, governmental statistics and etc. It is possible that the parents actually receive noisy signals about this information. However, as long as the signals are informative, the direction of cultural transmission on the population level would be the same.

[21]See Boyd and Richerson (1985, 2005) for discussions on human's tendencies of imitating the success.

[22]As shown by Bisin and Verdier (2001b), strong "cultural distaste" can lead to the phenomenon of cultural heterogeneity, since the alternative preference group has strong tendency to resist assimilation by the majority, even when the majority is more economically successful. Therefore, in a setting with imperfect empathy, the effect of political institutions on preference evolution may be diluted.

probability a child from a majority family adopts the preference of the alternative preference group. This only happens when a parent fails to inculcate his child with his own preference, but his child ends up finding a alternative preference group role model.

Each adult with preference θ (majority) from generation t solves the following:

$$(\circledast)\ \ \max_x [P_t^{\theta\theta}(x)F(\mu_t, \sigma(\mu_t), k(\mu_t)) + P_t^{\theta\theta'}(x)G(\mu_t, \sigma(\mu_t), k(\mu_t)] - c(x).$$

When $F(\mu_t, \sigma(\mu_t), k(\mu_t)) < G(\mu_t, \sigma(\mu_t), k(\mu_t))$, a majority parent knows that the average material payoff of the alternative preference group is higher. Therefore, this parent exerts no effort so that the probability that his child can meet a alternative preference group adult is maximized. In this case, the optimal effort $x^*(\mu_t, \theta) = 0$.

When $F(\mu_t, \sigma(\mu_t), k(\mu_t) \geq G(\mu_t, \sigma(\mu_t), k(\mu_t))$, a majority parent knows that the average material payoff of his own group is higher. Hence, the optimal effort $x^*(\mu_t, \theta)$ of $(\circledast)$ solves:

$$\mu_t(F(\mu_t, \sigma(\mu_t), k(\mu_t)) - G(\mu_t, \sigma(\mu_t), k(\mu_t)))\frac{\partial d(\mu_t, x)}{\partial x} = c'(x).$$

In this case, the optimal effort $x^*(\mu_t, \theta)$ is strictly positive.

Similarly, we can write down the decision problem faced by a alternative preference group parent and obtain the corresponding optimal effort level $x^*(\mu_t, \theta')$.

In the continuum population, $P_t^{\theta\theta'}(x^*(\mu_t, \theta))$ also represents the fraction of children from θ families who adopt preference θ' and $P_t^{\theta'\theta}(x^*(\mu_t, \theta'))$ represents the fraction of children from θ' families who adopt preference θ. We obtain the following difference equation describing the dynamic of the population:

$$\mu_{t+1} = \mu_t + (1 - \mu_t)P_t^{\theta\theta'}(x^*(\mu_t, \theta)) - \mu_t P_t^{\theta'\theta}(x^*(\mu_t, \theta')), \text{ with initial } \mu_0. \tag{7}$$

Note that equation (7) satisfies the properties of imitative dynamics (See Sandholm (2011)).

3 Political Institutions and Evolutionarily Stable Preferences

In this section, we study the stability of preferences in different political institutions, which essentially pinpoints under what circumstances the dynamic described in (7) would converge to zero ($\lim_{t\to\infty} \mu_t = 0$). To answer this question, we first need to provide the expressions of the average material payoffs of the two groups when taking the limit of μ to zero.

Let $\sigma_0 = \lim_{\mu\to 0} \sigma(\mu)$ and $k_0 = \lim_{\mu\to 0} \frac{k(\mu)}{\mu}$. Before calculating the average material payoff of each group in the limit, one should note that given the balancing equation (2), σ_0 can only take value in $[0,1]$, because the range of $\sigma(\mu)$ shrinks as μ decreases and σ_0 must be non-negative to ensure that the balancing equation is not violated in the limit. Since $\sigma_0 = 1$ implies a completely segregated matching market in the limit, which is rarely observed in the reality, we restrict our attention to $\sigma_0 \in [0,1)$.[23]

Substitute (3)-(4) into (5)-(6) and take μ to zero. We have:

$$\begin{aligned}
\lim_{\mu\to 0} F(\mu, \sigma(\mu), k(\mu)) &= \frac{1}{2}(V_h(\theta,\theta) + V_l(\theta,\theta)); &(8)\\
\lim_{\mu\to 0} G(\mu, \sigma(\mu), k(\mu)) &= (\frac{1}{2} + k_0)\sigma_0(V_h(\theta',\theta') + V_l(\theta',\theta'))\\
&\quad +[(\frac{1}{2} - k_0) - (\frac{1}{2} + k_0)\sigma_0]V_h(\theta',\theta)\\
&\quad +(\frac{1}{2} + k_0)(1-\sigma_0)V_l(\theta,\theta'). &(9)
\end{aligned}$$

These are the average material payoffs of the majority group and the alternative preference group in the limit respectively. Fixing an θ and an θ', we say θ is stable against θ' if the alternative preference group with θ' eventually get assimilated overtime. However, the majority in a society may not necessarily face the same type of alternative preference groups. Instead, cultural importations or immigrations may bring different preference traits into an incumbent population. Therefore, in this paper, we would like to see if θ can be prevalent given the presence of different θ'. If the preference trait of the majority group can assimilate various different preference traits, we call this majority's preference stable. Note that a preference trait is evolutionary stable in a society does not necessary implies that the society is completely homogeneous, since only economic related attributes in a preference trait evolve through the dynamic. Here is the general definition for evolutionarily stability:

Definition 1:
A preference $\theta \in \Theta$ is an evolutionarily stable preference (ESP) if for any alternative preference group with $\theta' \neq \theta$, there is a $\overline{\mu}_0 \in (0,1)$, such that $\lim_{t\to\infty} \mu_t = 0$ for the difference equation (7), given any $\mu_0 \in (0, \overline{\mu}_0)$.

Definition 1 states that a preference is evolutionary stable if a majority with this preference can assimilate alternative preference groups with different preferences in the long run. The following result provides the necessary and sufficient conditions for $\theta \in \Theta$ to be an ESP:

[23] Note that k_0's range depends on the value of σ_0. In Section 3.1 and Section 4, we discuss the effect of σ_0 on the boundary of k_0, which has important political implications.

Lemma 1

(i) The sufficient condition for θ to be an ESP is: for any $\theta' \neq \theta$,

$$\lim_{\mu \to 0} F(\mu, \sigma(\mu), k(\mu)) > \lim_{\mu \to 0} G(\mu, \sigma(\mu), k(\mu)). \tag{10}$$

(ii) If we replace the strict inequality in the above inequality with a weak inequality, it becomes the necessary condition for θ to be an ESP for $\forall \theta' \neq \theta$.

Proof: See details in the Appendix.

Intuitively, Definition 1 states that preference θ is evolutionarily stable preference (ESP) if any alternative preference group with preference $\theta' \neq \theta$ enters a population dominated by θ agents, the size of the alternative preference group eventually shrinks to zero. The cultural transmission mechanism specified in the previous section indicates that the size of the group with the higher average material payoff increases. Hence, if the average material payoff of the majority is always larger than that of the alternative preference group, the alternative preference group would eventually die out. Given θ and θ', the condition $\lim_{\mu \to 0} F(\mu, \sigma(\mu), k(\mu)) > \lim_{\mu \to 0} G(\mu, \sigma(\mu), k(\mu))$ ensures that the average material payoff of the majority is always larger than that of the alternative preference group if the size of alternative preference group is sufficiently small. Therefore, there always exists an initial condition, such that the dynamic described in (7) always converges to zero.[24]

We first consider a benchmark case, in which the allocation of high positions between the two groups is exogenously given as equal, i.e. $k(\mu) = 0$. We call this as proportional assignment. It is straightforward to see that the majority's preference is evolutionary stable under proportional assignment if the average material payoff of a majority member is higher than the average material payoff of a alternative preference group member when both of them have equal chances to be boss or the worker. Note that several works in the literature also consider preference evolution in asymmetric pairwise interactions with different roles and they get similar criteria for evolutionary stability.[25] Nevertheless, they assume that after the agents are matched in pairs, their roles are assigned randomly with equal probability. Hence, exactly half of the population take one role, the rest take the other as if there exists a political institution with proportional assignment. This shows

[24] In addition, from Lemma 1, one can see that the concept of evolutionarily stable preference (ESP) is an analog to the concept of evolutionarily stable strategy (ESS) in evolutionary game theory (see a discussion in Alger and Weibull (2012)).

[25] See Alger and Weibull (2012)'s example on donor-recipient interaction and Alger and Weibull (2013)'s examples on dictator game and ultimatum bargaining.

that the criterion for evolutionary stability for asymmetric pairwise interactions in the previous literature is just a special case of Lemma 1.

In the following analysis, we focus on how graduate changes in the distribution of preferences (alternative preference groups with preference traits that are similar to the majority's preference emerge) affect long-run economic outcomes in a society under different political institutions. We introduce a weaker stability concept, local evolutionary stable preference.[26] The precise definition of local stability is given as follows:

Definition 2
A preference $\theta \in \Theta$ is called ***locally*** evolutionarily stable preference (LESP), if there exists $\delta > 0$, such that for alternative preference group with any $\theta' \in B(\theta, \delta)\backslash\{\theta\}$, there is a $\overline{\mu}_0 \in (0, 1)$, such that $\lim_{t\to\infty} \mu_t = 0$ for the difference equation (7), given any $\mu_0 \in (0, \overline{\mu}_0)$.

In the next 3 sections, we examine a range of political institutions indexed by their degrees of inclusiveness (Acemoglu and Robinson (2012)). Inclusiveness measures how much scope do groups have to determine the allocation of high positions. We call a political institution more "exclusive" if the alternative preference group is excluded from high positions or facing high barriers to acquire high positions. On the other hand, we call a political institution more "inclusive" if the political representatives from the two groups interact more equally to determine the allocation of high positions.

3.1 Majoritarianism

We start our analysis by studying the evolution of preferences under an exclusive political institution in which the majority can exploit the alternative preference group. We call it "majoritarianism". It refers to the general case of "winner takes all". For example, The imperial examination since Sui Dynasty (AD 605) in Ancient China was an important channel for Chinese people to obtain high positions in the social hierarchy. Although this examination system was open to every citizen, it only tested the knowledge of Confucian morals. Hence, those who disagreed with the Confucian value system were actually completely excluded from accessing high positions. Today, direct

[26]The concept of evolutionary stable preference can be applied to study how a big breakthrough in primitives (an alternative preference group with a preference trait that is distinct from the majority's preference trait emerges) affects long-run economic outcomes under different political institutions. However, we need assumptions much stronger than Assumption [A1] to obtain sharp predictions.

democracy that simply follows majority voting but without sufficient constitutional checks and balances may also be considered as an example of this exclusive political institution.

In this exclusive political institution, only the political representatives of the majority group are active. They try to maximize the majority group's average material payoff $F(\mu, \sigma(\mu), k(\mu))$ by changing $k(\mu)$. If $F(\mu, \sigma(\mu), k(\mu))$ increases in $k(\mu)$, the majority would set $k(\mu)$ to its maximum. On the other hand, if $F(\mu, \sigma(\mu), k(\mu))$ decreases in $k(\mu)$, the majority would have no incentive to get more high positions at all. Instead, they would assign all the high positions to the alternative preference group to set $k(\mu)$ to its minimum.

Note that given the presence of segregation of the market $\sigma(\mu)$, the majority cannot take all the high positions available, since there are positive number of alternative preference group members matched in pairs, half of them need to have high positions in order to clear the matching market.[27] Nevertheless, the majority would take the rest high positions if $F(\mu, \sigma(\mu), k(\mu))$ increases in $k(\mu)$ and we have the following proposition:

Proposition 1

Under assumption [A1], every $\theta \in \Theta$ is LESP in a political institution with majoritarianism.

Proof: See details in the Appendix.

The key to the proof is that when the alternative preference group's preference θ' is close enough to the majority preference θ. $F(\mu, \sigma(\mu), k(\mu))$ always increases in $k(\mu)$. Therefore, under majoritarianism, the majority's political representatives set $k(\mu)$ to its maximum. The majority group members thus have a higher average material payoff and can assimilate the alternative preference group.

Although, majority voting is adopted as one of most prevalent voting rule in democratic countries, the analysis in this section suggests that, in a highly homogeneous society (the size of the majority is much larger comparing to the size of the alternative preference group), where the incumbents' preferences are associated with unfavorable economic outcomes, it may not be a good rule for determining the allocation of scarce resources, since the "tyranny of the majority" may impede the spread of preferences associate with more efficient economic outcomes in the society. This demonstrates the importance of "examining" democracy emphasized by Roemer (2006).

[27] Given this property of the matching, in Section 4, we discuss how the alternative preference group may use local segregation as self-defensive mechanism against the majority.

3.2 Political Bargaining: Egalitarian Representative Democracy

Unlike non-divisible public goods such as harbor dredging or national defense, which is usually determined by voting rules such as majority voting, high positions in the social hierarchy are divisible goods. In many circumstances, the division of such goods is determined by fine-grained bargaining. In the following two sections, we treat the allocation of high positions in the social hierarchy as an endogenous variable that is determined by negotiation between the political representatives from the majority and the alternative preference group. Note that we have used the parsimonious notation $k(\mu)$ in the previous section. Here we endogenize this parameter to be related to θ and θ'. Therefore, we use $k(\mu, \theta, \theta')$ instead of $k(\mu)$.

Consider a political institution with political bargaining. The allocation of high positions in the social hierarchy is determined by the bargaining of political representatives from both groups. As stated in Macleod (2013), all successful human institutions delegate control rights to those individuals (the political representatives in our context) that have the best information and the best incentives to decide appropriately. Since agents in each group have the same preferences as well as common interests and shared goals, here we assume that selecting political representatives is effective among each group.[28] In addition, for simplicity, we do not model explicitly the incentive problems between the group members and their elective representatives.[29] Instead, we assume the political representatives from both groups willingly represent the common interests of their own groups.

In this section, we assume that the proportion of representatives for a group is exactly the same as the size of the group and call such a political institution as political institution with egalitarian representative democracy. For simplicity, from now on we call it the egalitarian bargaining model. The bargaining power of a group is measured by the ratio between the proportion of representatives and the size of the group. Hence, the bargaining power of the two groups are equal. In other words, egalitarian bargaining model serves as an inclusive political institution and it provides "equality of opportunity" for the two groups. This political institution represents the common form of proportional representational democracy, where strong constitutional checks and balances are ensured.

The negotiation between the majority and the alternative preference group is modelled as a Nash bargaining problem. Both the majority and the alternative preference group want to max-

[28] Note that there is an important literature considering the formation of interest groups and parties (Olson (1965), Buchanan, Tollison and Tullock (1980), Becker (1983), Congleton (1986) and Austin-Smith (1987). They study mainly how to solve the free rider problem of political action in rent seeking and voting issues.

[29] See Persson and Tabellini (2000).

imize the average material payoffs of their own kinds. Therefore, the representatives of the two groups collectively bargain over the division of the high positions (being role h in the pairwise interaction). If they cannot come to a conclusion, both groups get zero. The solution $k^*(\mu,\theta,\theta')$ to the Nash bargaining problem solves:

$$(\dagger)\ \max_{k(\mu,\theta,\theta')}(F(\mu,\sigma(\mu),k(\mu,\theta,\theta'))-0)^{1-\mu}(G(\mu,\sigma(\mu),k(\mu,\theta,\theta'))-0)^{\mu}.$$

The interior solution $k^*(\mu,\theta,\theta')$ to (†) satisfies the following first order condition:

$$G(\mu,\sigma(\mu),k^*(\mu,\theta,\theta'))(1-\mu)F_k(\mu,\sigma(\mu),k(\mu,\theta,\theta'))+F(\mu,\sigma(\mu),k^*(\mu,\theta,\theta'))\mu G_k(\mu,\sigma(\mu),k(\mu,\theta,\theta'))=0. \tag{11}$$

The marginal average material payoff of the majority group with respect to the allocation of high positions is represented by $(1-\mu)F_k(\mu,\sigma(\mu),k(\mu,\theta,\theta'))$. If $(1-\mu)F_k(\mu,\sigma(\mu),k(\mu,\theta,\theta'))>0$, the majority benefits from acquiring more high positions. The marginal average material payoff of the alternative preference group with respect to the allocation of high positions is represented by $\mu G_k(\mu,\sigma(\mu),k(\mu,\theta,\theta'))$. If $\mu G_k(\mu,\sigma(\mu),k(\mu,\theta,\theta'))<0$, the alternative preference group benefits from acquiring more high positions.

Let $k_0^*(\theta,\theta')=\lim_{\mu\to 0}\frac{k^*(\mu,\theta,\theta')}{\mu}$. When taking μ to zero, the expressions of $(1-\mu)F_k(\mu,\sigma(\mu),k(\mu,\theta,\theta'))$ and $-\mu G_k(\mu,\sigma(\mu),k(\mu,\theta,\theta'))$, the marginal benefits of acquiring high positions for the two groups respectively, are given as follows:

$$\lim_{\mu\to 0}(1-\mu)F_k(\mu,\sigma(\mu),k(\mu,\theta,\theta'))=\sigma_0(V_h(\theta,\theta)+V_l(\theta,\theta))+(1-\sigma_0)V_h(\theta,\theta')-(1+\sigma_0)V_l(\theta',\theta); \tag{12}$$
$$\lim_{\mu\to 0}-\mu G_k(\mu,\sigma(\mu),k(\mu,\theta,\theta'))=-\sigma_0(V_h(\theta',\theta')+V_l(\theta',\theta'))+(1+\sigma_0)V_h(\theta',\theta)-(1-\sigma_0)V_l(\theta,\theta'). \tag{13}$$

To study stability of preferences in this political institution, we first need to determine the signs of the limit derivatives shown in (12) and (13). Given assumption [A1], we have the following result:

Lemma 2

Under Assumption [A1], for each $\theta\in\Theta$, there exists $\delta>0$, such that for any $\theta'\in B(\theta,\delta)$, $\lim_{\mu\to 0}(1-\mu)F_k(\mu,\sigma(\mu),k(\mu,\theta,\theta'))>0$, $\lim_{\mu\to 0}-\mu G_k(\mu,\sigma(\mu),k(\mu,\theta,\theta'))>0$.

Proof: See details in Appendix.

Lemma 2 ensures when θ' is close enough to θ, both groups benefits from acquiring more high positions in the social hierarchy. In addition, when θ' and θ are close enough, it is always true that the interior solution exists and is unique. In other words, when considering local stability, we do not worry about corner solutions to the Nash bargaining problem. Given this, we have the following proposition:

Proposition 2

(1) θ is LESP in the egalitarian bargaining model, if there exists $\delta > 0$ such that for any $\theta' \in B(\theta, \delta)\backslash\{\theta\}$,

$$\lim_{\mu \to 0}(1-\mu)F_k(\mu, \sigma(\mu), k(\mu, \theta, \theta')) > -\lim_{\mu \to 0}\mu G_k(\mu, \sigma(\mu), k(\mu, \theta, \theta')). \tag{14}$$

(2) If we replace the strict inequality with a weak inequality in the above inequality, it becomes the necessary condition.

Proof: See details in the Appendix.

Proposition 3 states that a preference θ is LESP if the majority with preference θ marginally benefits more from getting high positions than the alternative preference group with some nearby preference θ' does. To better understand inequality (14), let us look at the uniformly random matching case, that is $\sigma_0 = 0$. Define $TSF(\theta, \theta') = V_h(\theta, \theta') + V_l(\theta, \theta')$ as the total surplus of a firm formed by an θ boss and an θ' worker. In this case, inequality (14) can be rewritten as:

$$TSF(\theta, \theta') > TSF(\theta', \theta). \tag{15}$$

Let us consider the boss-worker example. Inequality (16) implies that when a majority member matches with a alternative preference group member, the firm they form yields a higher total surplus if the majority member is the boss. In other words, the majority's preference "suits" the role of boss better than the alternative preference group's preference. To summarize, preference evolution in egalitarian bargaining model selects preferences that locally have the biggest comparative advantage in being a boss instead of a worker. This result sharply contrasts to the one we obtained in majoritarianism, since a society can no longer be locked into any state.

Nevertheless, a preference trait that locally has the biggest locally comparative advantage in being a boss instead of a worker does not necessary induce the locally highest average payoff for the whole society if all the society's members adopt such preference. Therefore, the relationship between political institutions and efficiency is not obvious. We provide a detail discussion in Section 5.1.

3.3 Political Bargaining: Uneven Bargaining Powers

Acemoglu and Robinson (2006b, 2008) argue that there are two types of political powers. The first type is called *de jure* political power, whose allocation is exogenously determined by political institution. For example, political institution with majoritarianism entitles the majority the exclusive power to determine the allocation of high positions. On the other hand, the egalitarian bargaining model provides a political "level playing field" for both groups to bargain over the distribution of high positions in the social hierarchy. Hence, the bargaining powers (*de jure* political powers) are equal for the two groups in such political institution.

The second type is called *de facto* political power, the distribution of which is an equilibrium outcome of interactions between groups and responds to incentives of the groups. In political institutions with majoritarianism, such kind of political powers do not matter. However, in the egalitarian bargaining model, the distribution of *de facto* political powers comes into play and it is measured by the ratio between the two groups' marginal benefits of getting more high positions.

Majoritarianism serves as an extreme case in which there is no constitutional checks and balances that ensure certain power entitled to the alternative preference group, while the egalitarian bargaining model neglects the possibility of voting restrictions faced by the alternative preference group (Besley and Persson (2011)). For example, before suffrage expansion, some ethnic groups may be excluded from being represented in the parliament. Nowadays, new immigrants in some countries may still face high entry barriers for participating in politics. A more commonly seen political institution should be one in which both groups enjoy certain but not necessary equal *de jure* political powers. Hence, in this subsection, we extend the political bargaining model we develop in Section 3.3 to allow for different distributions of bargaining powers between the two groups (the distribution of bargaining powers can serve as a measure of inclusiveness or cohesiveness of a political institution suggested by Acemoglu and Robinson (2012) and Besley and Persson (2011)), For example, the proportional electoral system is more inclusive than a majoritarian electoral system. This allows us to study the interaction between the two types of powers.

We modify the Nash bargaining problem as follows and the solution $k^*(\mu, \theta, \theta')$ to the Nash bargaining problem solves:

$$(\ddagger) \max_{k(\mu,\theta,\theta')} (F(\mu, \sigma(\mu), k(\mu, \theta, \theta')) - 0)^{p(\mu)} (G(\mu, \sigma(\mu), k(\mu, \theta, \theta')) - 0)^{q(\mu)},$$

where $p(\mu)$ denotes the bargaining power of the majority and $q(\mu)$ denotes the bargaining power of the alternative preference group. Note that both p and q are functions of μ. In other words, the bargaining powers are related to the population distribution. First, to normalize these bargaining powers, we assume that $\lim_{\mu\to 0} p(\mu) = 1$. Second, in order to obtain interesting predictions, we restrict our attention to the case in which the bargaining power of the alternative preference group decreases at the same speed as the size of the alternative preference group, that is, $\lim_{\mu\to 0} \frac{q(\mu)}{\mu} = q_0 > 0$. If we instead assume $\lim_{\mu\to 0} q(\mu) > 0$ or assume $\lim_{\mu\to 0} \frac{q(\mu)}{\mu} = 0$, then the bargaining power of the alternative preference group is either too strong or too weak for the existence of interior solution of the Nash bargaining problem.

Note that when $p(\mu) = 1 - \mu$ and $q(\mu) = \mu$, the political powers of the two groups are exactly equal since the bargaining power of a group is exactly represented by its group size and $q_0 = 1$. This is the case we discussed in the egaliterian bargaining model. On the other hand, when $q_0 = 0$, we have a political institution with majoritarianism. In this subsection, we allow q_0 to take any values in $[0, 1]$, which reflects the fact that such a political institution serves as a convex combination of egalitarian bargaining model and majoritarianism.[30]

The interior solution $k^*(\mu, \theta, \theta')$ to (‡) satisfies the following first order condition:

$$G(\mu, \sigma(\mu), k^*(\mu, \theta, \theta'))p(\mu)F_k(\mu, \sigma(\mu), k(\mu, \theta, \theta')) + F(\mu, \sigma(\mu), k^*(\mu, \theta, \theta'))q(\mu)G_k(\mu, \sigma(\mu), k(\mu, \theta, \theta')) = 0. \tag{16}$$

To facilitate the characterization of the relationship between the bargaining powers and the allocation of high positions, we define the following threshold function for the bargaining process.

$$\begin{aligned} \hat{M}(\theta, \theta') &= \lim_{\mu\to 0}[(\frac{(1-\mu)F_k(\mu, \sigma(\mu), k(\mu, \theta, \theta'))}{F(\mu, \sigma(\mu), 0)})/(\frac{-\mu G_k(\mu, \sigma(\mu), k(\mu, \theta, \theta'))}{G(\mu, \sigma(\mu), 0)})] \\ &= \lim_{\mu\to 0}[(\frac{1-\mu}{\mu})(\frac{E_{F,k}}{E_{G,k}}|_{k=0})]. \end{aligned} \tag{17}$$

$E_{F,k}$ is the elasticity of a majority member's average material payoff with respect to the allocation of high positions and $E_{G,k}$ is the elasticity of a alternative preference group member's average material payoff with respect to the allocation of high positions.

This threshold function denotes the ratio between the percentage change in average material payoffs of the majority and the percentage change in average material payoffs of the alternative preference group when the allocation of high positions between the two groups changes from equal split to slightly uneven, scaled by the relative sizes of the two groups. Note that this threshold function always exists and $\lim_{\theta'\to\theta} \hat{M}(\theta, \theta') = 1$.

Given this threshold function, we can determine the sign of $k_0^*(\theta, \theta')$, the allocation of high positions between the two groups, as shown in the following lemma:

[30]Note that Acemoglu and Robinson (2006b, 2008) also use exogenous parameters to indicate the effectivenesses of influencing political decision making of different groups. We follow the same spirit here.

Lemma 3

When $\lim_{\mu\to 0}(1-\mu)F_k(\mu,\sigma(\mu),k(\mu,\theta,\theta')) > 0$ and $\lim_{\mu\to 0} -\mu G_k(\mu,\sigma(\mu),k(\mu,\theta,\theta')) > 0$, we have

(i) if $q_0 < \hat{M}(\theta,\theta')$, then $k_0^*(\theta,\theta') > 0$.

(ii) if $q_0 = \hat{M}(\theta,\theta')$, then $k_0^*(\theta,\theta') = 0$;

(iii) if $q_0 > \hat{M}(\theta,\theta')$, then $k_0^*(\theta,\theta') < 0$.

Proof: See details in Appendix.

Lemma 3 shows that when both groups benefits from acquiring more high positions in the social hierarchy, the allocation of high positions is determined by the comparison of the advantage in *de jure* political power of the majority q_0 relative to the alternative preference group and the advantage in *de facto* political power of the alternative preference group $\hat{M}(\theta,\theta')$ relative to the majority group.

We now characterize the relationship between the bargaining power and the interior solution of the Nash bargaining problem for every $\theta \in \Theta$, when letting θ' approach θ.

Lemma 4

Under assumption [A1], for any $\theta \in \Theta$, if $q_0 < 1$, then there exists $\delta > 0$ such that for all $\theta' \in B(\theta,\delta)\backslash\{\theta\}$, $k_0^*(\theta,\theta') > 0$.

Proof: See details in Appendix.

Lemma 4 is induced by Lemma 2 and Lemma 3 and relying on the fact $\lim_{\theta'\to\theta} \hat{M}(\theta,\theta') = 1$. The lemma states that when θ and θ' is close enough, if the majority has a fixed advantage in bargaining power ($q_0 < 1$), the majority can acquire high positions more than half of its group size in the collective bargaining. Given this, we have the following result:

Proposition 3

In political institution with uneven bargaining powers, every $\theta \in \Theta$ is LESP.

Proof: See details in the Appendix.

The proof of this proposition uses the fact that playing role h is always better than playing role l when θ' is sufficiently close to θ, and the results of Lemma 4, which state that when $q_0 < 1$, the majority with θ can acquire more role h in the political bargaining as long as the alternative preference group's preference θ' is close to θ.

In other words, even tiny advantage in bargaining power grants the majority with more high positions, which allows the majority's preference to prevail locally. At first glance, Proposition 3 provides a similar prediction as Proposition 1. It seems that a political institution close to the egalitarian bargaining model has no difference from a political institution with majoritarianism. However, this is an wrong impression. To see the essential distinction between the two types of political institutions, we introduce the following definition:

Definition 3

The assimilation set $S(\theta, q_0)$ of preference $\theta \in \Theta$, given bargaining power $q_0 \in [0,1]$, is the largest open ball in Θ centered at θ, such that for any $\theta' \in S(\theta, q_0)/\{\theta\}$:

(1) $\lim_{\mu \to 0}(1-\mu)F_k(\mu, \sigma(\mu), k(\mu, \theta, \theta')) > 0$ and $\lim_{\mu \to 0} -\mu G_k(\mu, \sigma(\mu), k(\mu, \theta, \theta')) > 0$;

(2) there is a $\overline{\mu}_0 \in (0,1)$, such that $\lim_{t \to \infty} \mu_t = 0$ for the difference equation (7),$\forall \mu_0 \in (0, \overline{\mu}_0)$.

The assimilation set $S(\theta, q_0)$ of preference θ, given q_0, is defined as the largest open ball surrounding θ, such that for a population with majority of θ and alternative preference group of $\theta' \in S(\theta, q_0)/\{\theta\}$, both groups would benefits from getting more high positions and the majority would eventually assimilate the alternative preference group. We are interested in how the size of such a set varies as the bargaining power changes and we have the following result:

Proposition 4

When q_0 increases from q_0^1 to q_0^2, where $0 \leq q_0^1 < q_0^2 \leq 1$, for any $\theta \in \Theta$, we have $S(\theta, q_0^1) \supseteq S(\theta, q_0^2)$.

proof: See details in Appendix.

Proposition 4 shows that in political bargaining, as inclusiveness of the political institution increases ($q_0 \uparrow$), the assimilation set shrinks. Hence, preference evolution has stronger selection power under more inclusive political institutions. This shows that as the *de jure* political power of the majority diminishes, *de factor* political power becomes more important in affecting preference evolution.

To facilitate the understanding of this result, let us consider the boss-worker example again. In the uniformly random matching case ($\sigma_0 = 0$), given fixed θ and q_0, for any $\theta' \in S(\theta, q_0)$, θ and θ'

satisfy

$$\frac{1-q_0}{q_0}(V_h(\theta,\theta')-V_l(\theta',\theta))+TSF(\theta,\theta')>TSF(\theta,\theta') \tag{18}$$

This inequality states that the majority group with preference trait θ can assimilate the alternative preference group with preference trait θ' if the total surplus generated by a firm with a majority boss and a alternative preference group worker plus a premium $\frac{1-q_0}{q_0}(V_h(\theta,\theta')-V_l(\theta',\theta))$ is higher than the total surplus generated by a firm with a alternative preference group boss and a majority worker. One can see the difference between this inequality and inequality (15) in the discussion of the egalitarian bargaining model is the premium term. Moreover, the premium term increases as the level of inclusiveness q_0 decreases. This implies that, as a political institution becomes more exclusive, whether the majority's preference actually "suits" the high position better than the alternative preference group's preference becomes less important. This bridges out conclusions drawn previously on majoritarianism and egalitarian bargaining model.

4 Local Segregation

In Section 3, we study whether the majority's preference trait can be stable against the emergence of the alternative preference group. In this section, we turn our focus to the local segregation problem of the alternative preference group.

In many circumstances, alternative preference group is the disadvantaged group in political decision making. When the alternative preference group fails to have sufficient political power in the political institution, do they have an alternative way to offset the majority's political powers? As we know, the political institutions we study determine the allocation of high positions in the social hierarchy. However, more self-matching in the labor market can guarantee a group to have more bosses who hire agents from the same group (certain immigrant groups such as Chinese and Japanese in the United States establish closely connected ethnic business networks (Hirschman and Wong (1986)). Hence, the alternative preference group may effectively reduce the impact of the political advantage possessed by the majority group, by increasing its members' rate of self matching.

In this section, we relax the assumption that the segregation of the labor market $\sigma(\mu)$ is exogenously given. Instead, we assume that the political leaders from the alternative preference group can segregate the alternative preference group within the labor market, so that the probability of matching with their own kind is higher. For example, the alternative preference group political leaders can promote unique ethnic markers such as dress codes and dialects that increase the utility gain of self-matching. On the other hand, the alternative preference group political leaders can also induce the alternative preference group to relocate, so that they are geographically segregated from the majority. For example, certain immigrant groups form ethic enclaves and establish enclave labor market to hire their own group members.

If the average material payoff of the alternative preference group outweighs that of the majority due to higher degrees of local segregation, the alternative preference group members in turn have incentives to inculcate their own preferences to their children and cultural heterogeneity is preserved. In reality, one can observe some ethnic groups have both strong tendency of self-matching in the labor market as well as strong incentive to preserve their own cultures across generations.

Assume that the main motivation for the alternative preference group political leaders is to maximize the average material payoff of the alternative preference group members. Whether a certain preference trait can survive through intentional local segregation depends on various factors such as the alternative preference group political leaders' ability to induce segregation as well as the cost of segregation. Nevertheless, the most fundamental question is whether the alternative preference group members would benefit from segregation at the first place. Specifically, whether increasing $\sigma(\mu)$ can increase the average material payoff of the alternative preference group members. In this section, we formally explore this question. We have the following results:

Proposition 5

In the benchmark case with proportional assignment, there exists a $\overline{\mu} > 0$ such that for any $0 < \mu < \overline{\mu}$, an alternative preference group with preference $\theta' \in \Theta$ would benefit from increasing local segregation against the majority with preference $\theta \in \Theta$ if

$$V_h(\theta', \theta') + V_l(\theta', \theta') > V_h(\theta', \theta) + V_l(\theta, \theta'). \tag{19}$$

Proof: It is straightforward to see that the average material payoff of the alternative preference group is an increasing function of σ_0 when μ converges to zero, if inequality (20) is satisfied. *Q.E.D.*

Proposition 5 shows that in a political institution with no political pressure on the allocation of high positions in the social hierarchy, the motivation of increasing local segregation by the alternative preference group entirely comes from the fact that the alternative preference group members have a higher material payoff by self-matching than matching with the majority members on average.

Proposition 6

In a political institution with majoritarianism, there exists a $\overline{\mu} > 0$ such that for any $0 < \mu < \overline{\mu}$, an alternative preference group with preference $\theta' \in \Theta$ would always benefit from increasing local segregation against the majority with preference $\theta \in \Theta$, if $\theta \in B(\theta', \delta)$, for some $\delta > 0$.

Proof: See details in Appendix.

In the proof of Proposition 6, one can see that when the majority group's political representatives want to pursue more high positions, they exploit their exclusive political advantage to obtain the maximal amount of high positions. However, this maximum is a decreasing function of σ_0 and the alternative preference group's average material payoff is an increasing function of σ_0, when μ approaches zero. Proposition 6 implies that when the majority has the exclusive right to determine the allocation of high positions in the social hierarchy, local segregation can serve as a self-defensive mechanism for the alternative preference group, since the alternative preference group can offset the political advantage of the majority by increasing local segregation.

Next, let us explore the motivation of local segregation for the alternative preference group political leaders in political institution with political bargaining.

Proposition 7

In a political institution with political bargaining, there exists a $0 < \overline{q}_0 < 1$ and a $\overline{\mu} > 0$, such that for any $\overline{q}_0 < q_0 \leq 1$ and $0 < \mu < \overline{\mu}$, an alternative preference group with preference θ' would benefit from increasing local segregation against majority with preference $\theta \in B(\theta', \delta)$, for some $\delta > 0$, if

$$V_h(\theta, \theta') + V_l(\theta', \theta) > V_h(\theta, \theta) + V_l(\theta, \theta), \text{ and } V_h(\theta', \theta) + V_l(\theta, \theta') > V_h(\theta', \theta') + V_l(\theta', \theta'). \quad (20)$$

On the other hand, an alternative preference group with preference θ' cannot benefit from increasing local segregation against majority with preference $\theta \in B(\theta', \delta)$, for some $\delta > 0$, if

$$V_h(\theta, \theta') + V_l(\theta', \theta) < V_h(\theta, \theta) + V_l(\theta, \theta), \text{ and } V_h(\theta', \theta) + V_l(\theta, \theta') < V_h(\theta', \theta') + V_l(\theta', \theta'). \quad (21)$$

Proof: See details in Appendix.

Proposition 7 describes the two possible scenarios that can arise in political institution with political bargaining: 1) if both the majority and the alternative preference group members do worse on average by self-matching than matching with agents from their opposite groups, then the alternative preference group can benefit from increasing local segregation; 2) if both the majority and the alternative preference group members do better on average by self-matching than matching with agents from their opposite groups, then the alternative preference group cannot benefit from increasing local segregation.[31]

These results seem counter-intuitive at the first glance. Recall that under proportional assignment, the alternative preference group cannot benefit from increasing local segregation when its members have a higher average material payoff by matching with the majority members than self-matching. Why is it that under political bargaining, the alternative preference group who has preference trait that satisfies the same property (as stated in the second inequality in (20)), instead would benefit from increasing local segregation?

Note that the matching process we specified is highly skewed, given that the sizes of the two groups are unequal. When the size of the alternative preference group is sufficiently small, the probability of a alternative preference group worker matching with a alternative preference group boss is approximately equal to the degree of segregation $\sigma(\mu)$. Hence, when the alternative preference group gets more high positions (the fraction of alternative preference group worker decreases), the pairs of self-matching within the alternative preference group decreases and more alternative preference group bosses are matched with majority workers. When the alternative preference group members have a higher average material payoff by matching with the majority members than self matching, the marginal benefit of getting more high positions for the alternative preference group increases when the degree of segregation increases. On the contrary, when the majority gets more high positions, the pairs of self-matching within the majority group increases. Hence, when the majority members have a higher average material payoff by matching with the alternative preference group members than self matching, the marginal benefit of getting more high positions for the majority decreases when the degree of segregation increases. Recall that the equilibrium allocation of high positions is determined by the comparison of the marginal benefit of getting more high positions of the two groups. Therefore, when condition (20) is satisfied, the alternative preference group can benefit from increasing segregation because the political institution would reward the group with more high positions. The interpretation of condition (21) follows the same spirit.

In sum, Proposition 5 to 7 show how different political institutions determine the motivation for the alternative preference group political leaders to segregate their own group members from the majority in the matching market. This may help to better understand the underlying political

[31] Unfortunately, there is no definite answer for the cases in which one group does better on average by self-matching, while the other group does not.

determines for why some preference traits may survive in one society, but fails to do so in another. In section 5.2, we further discuss the aggregate effect of local segregation on economic outcomes of a society through preference evolution.

5 Discussion

Social scientists have long considered the impact of political institutions on economic outcomes through the channel of preference evolution. Weber (1930) argues that the "Spirit of Capitalism" including hard work, prudence and thrift, as opposed to the "Economic Traditionalism",[32] was the key to the development of technologies and modern enterprises that gave rise to the Industrial Revolution. However, Weber also emphasizes on the importance of political institutions. He asserts that one of the fundamental socio-economic prerequisites for the emergence and prevalence of the "Spirit of Capitalism" was that in the Western European cities, urban communities had reached a high level of political autonomy, leading them from agrarian feudalism to "Bourgeois" society, which distinguished the European experience from those of India and China. This transition in political institutions in Western European countries laid down the foundation for the "Economic Traditionalism" to give way to the "Spirit of Capitalism". More specifically, the inclusive and stable political institutions in Britain gave the chance for those who had "the spirit of capitalism" to own their innovations as well as the permission to enter traditional industry with their innovations. This allowed them to establish more efficient modern enterprises and accumulate more wealth, which at the same time forced those "traditional" people to give up their way of living. Soon, the "Spirit of Capitalism" spread through the Western European and it was no longer attached to its religious root of Protestantism.

Hence, to better understand the relationship between political institutions and long-run economic performance, one needs to first consider how political institutions may affect the evolution of preferences. In Section 5.1 and 5.2, we discuss in detail how this model can contribute to explaining the difference between societies with distinct political institutions from a preference evolutionary perspective.

[32] Weber (1930) describes people of "Economic Traditionalism" as those who did not ask how much they can earn in a day if they do as much work as possible, but ask how much they must work in order to earn the wages, which take care of their traditional needs.

5.1 Political Institutions and Economic Performance

As indicated by Acemoglu and Robinson (2012), the winners' identities of the conflict over scarce resources have fundamental implications for a society's economic trajectory. If the groups standing against growth are the winners, they can successfully block economic growth and the economy will stagnate. Following the same spirit, we focus on identifying the "winners" of preference evolution (the preference trait that is adopted by more and more people over time in a society), to better understand the role of political institutions in economic performance.

Our results in Section 3.1 and 3.3 suggest that in more exclusive political institutions, it is possible that even a majority with preferences associated with unfavorable economic outcomes may be able to assimilate alternative preference groups with distinct preferences which could lead to favorable economic outcomes. In other words, all preference traits have high probabilities of being the "winners" of preference evolution. On the other hand, our results in Section 3.2 and 3.3 suggest that preference evolution has stronger selection power in more inclusive political institutions and only preference traits that locally have the biggest comparative advantage of being a boss instead of being a worker have high probabilities to be the "winners" of preference evolution.

To relate the identities of the "winners" of preference evolution in different political institutions with economic performance of different societies, let us consider the following example. This example demonstrates the importance of preference evolution for understanding the intricate relationship between political institutions and economic performance.

Consider a population consists of two different preference traits: θ_H and θ_L. θ_H agents are hard working, while θ_L agents are leisure loving. Assume that both preference groups prefer more high positions. In each pairwise interaction, a boss can invest to improve physical capital, but it depends on the society's technology level. On the other hand, a worker can exert effort to produce. The output level of a firm is determined by physical capital as well as manual labor.

Assume that the technology level of the society is high. The marginal return from physical capital is higher than manual labor. In this case, we have the following inequalities:

$$TSF(\theta_H, \theta_H) > TSF(\theta_H, \theta_L) > TSF(\theta_L, \theta_H) > TSF(\theta_L, \theta_L) \tag{22}$$

The second inequality states that the total surplus generated by a firm consisting of a θ_H boss and a θ_L worker is higher than that by a firm consisting of a θ_L boss and a θ_H worker, given that physical capital is more important in determining output. If the Nash bargaining problem has interior solution, according to Proposition 2, in random matching case, θ_H can be prevalent against θ_L under egalitarian bargaining model, which leads to an efficient average output of $\frac{1}{2}TSF(\theta_H, \theta_H)$

in the long run. In addition, θ_L cannot be prevalent against θ_H, which prevents the society from trapping in a state associated with the lowest average output of $\frac{1}{2}TSF(\theta_L, \theta_L)$. Therefore, in this case, inclusive political institutions are more conducive than exclusive political institutions for efficiency in the long run.

On the other hand, assume that the technology level of the society is low. In this case, the marginal return from manual labor is instead higher than physical capital. Even a boss is willing to invest more to improve the physical capital, the output would be still low if his worker does not exert sufficient effort. In this case, we have the following inequalities:

$$TSF(\theta_H, \theta_H) > TSF(\theta_L, \theta_H) > TSF(\theta_H, \theta_L) > TSF(\theta_L, \theta_L) \tag{23}$$

One can see that θ_L can be prevalent in the random matching case under egalitarian bargaining model, which leads to inefficiency, while θ_H fails to be prevalent. The intuition behind this result is that inclusive political institutions may fail to internalize the externalities generated by cultural transmission. On the other hand, θ_H can only be prevalent in exclusive political institutions. Therefore, in this case, exclusive political institutions are more conducive than inclusive political institutions for efficiency in the long run.

This example demonstrates the relationship between political institutions and economic performance is subtle given the presence of preference evolution.

Note that in the literature of technology adoption, a so called "economic losers" hypothesis has been widely discussed. It captures the idea that economic monopolies have the political power to block the introduction of a new technology by a rival that will capture the market.[33] In a similar vein, Acemoglu and Robinson (2000, 2006c) propose the "political losers" hypothesis for explaining the impediment of economic development. The "political losers" they refer to are not the members of the group that do not have political power. Instead, "political losers" are those who are currently in control but may lose their political powers with high probability when new technology is introduced. Hence, they have the incentives to block innovation. In our model, on the other hand, innovation may be endogenously determined by preferences. Hence, if the appearance of innovation from the alternative preference group can erode either the economic profit (*de facto* political power) or the political control (*de jure* political power) of the majority, it is not possible for the majority to block innovation any more, since cultural transmission leads more people to adopt the preferences associated with innovation.

Acemoglu and Robinson (2006b, 2008) also propose a theory for explaining the persistence of

[33] See Acemoglu and Robinson (2000) for a detailed discussion.

inefficient economic institutions given changes in political institutions. The main argument is that the elites of a society would invest extensively on increasing their *de facto* political powers after they lose their *de jure* political powers in a democratic political institution, since they have strong incentives to maintain their monopolistic power in the market. Our model instead provides an alternative explanation for the persistence of inefficient economic institutions. As in our model of political bargaining discussed in Section 3.3, *de facto* political power of a group is measured by the marginal benefit of getting more high positions for the group, which is endogenously determined by the preferences of the two groups. Even if the majority loses its *de jure* political power (bargaining power), as long as the majority's marginal benefit of getting more high positions in the social hierarchy is higher than that of the alternative preference group, in an inclusive political institution, the majority's preference would be prevalent; as shown in the example above, it is possible that the inefficient economic institutions endogenously generated by majority's preference would persist in such case.

5.2 Assimilation Pressure and Cultural Heterogeneity

Our model also sheds lights on assimilation of minority ethnic groups into the host culture and resistance to the pressure of assimilation.

As discussed in Kuran and Sandholm (2008), in the early 20th century, government and civic leaders actively promoted "Americanization" by rewarding immigrants who opted for assimilation with promotions and status. This conformity pressure induces immigrants to make compromises. In many circumstances, such compromises are realized across generations. In our model, if the political institution is more exclusive, the direction of cultural transmission leads to cultural assimilation since the parents from the alternative preference group are less tempted to inculcate their own preference into their children given that assimilating to the majority group leads to a higher chance of obtaining a high position in the social hierarchy.

Although the assimilation pressure is strong in many societies, cultural heterogeneity is commonly observed. For example, ethnic groups such as Asian and Jewish groups in the United States manage to reserve their cultural identities. The "cultural distaste" theories pioneered by Bisin and Verdier (2001) successfully explain such phenomena given that the parents have imperfect empathy. Nevertheless, in certain real life examples, pragmatic goals (economic sucess) instead of normative objectives (for example, reserving religious identity) may serve as the main motives in the cultural transmission processes (perfect empathy). Therefore, we believe that cultural heterogeneity needs to be also explained under the assumption of perfect empathy.

Interestingly, our model provides a possible explanation. As discussed in Section 4, when the alternative preference group does not possess an advantage in political power, the political leaders of the alternative preference group can segregate their group members within the labor market. Although the main motivation of local segregation for the alternative preference group political leaders is to increase the average material payoff of the alternative preference group members within a generation, it in turn affects the inter-generational cultural transmission and thus serves as an important force that helps the alternative preference group to resist assimilation.[34]

A more important question is how local segregation of the alternative preference group affects economic outcomes in the long run. To answer this question, let us again consider the example in Section 5.1, in which there are two preference traits in the population: θ_H and θ_L and inequality (22) is satisfied.

Suppose the political institution in a society is majoritarianism and the majority's preference is θ_H, θ_H can always be prevalent regardless of the level of segregation. On the other hand, if the majority's preference is θ_L, and if the alternative preference group with θ_H can effectively raise the level of segregation to $\sigma_0 \approx 1$, then the alternative preference group's preference θ_H is able to spread because the average material payoff of the alternative preference group is approximately equal to $\frac{1}{2}TSF(\theta_H, \theta_H)$, which is higher than the average material payoff of the majority which is approximately equal to $\frac{1}{2}TSF(\theta_L, \theta_L)$. Therefore, local segregation can increase the average material payoff of the whole population in the long run under more exclusive political institutions.

Suppose instead the political institution in a society is egalitarian representative democracy, and the majority's preference is θ_H, from inequality (22), we know that under uniform random matching, θ_H can be prevalent. However, if the alternative preference group with θ_L can effectively raise the level of segregation to $\sigma_0 \approx 1$, then θ_H can be prevalent only if approximately,

$$TSF(\theta_H, \theta_H) + TSF(\theta_L, \theta_L) > 2TSF(\theta_L, \theta_H). \tag{24}$$

[34]Note that in the literature of cultural transmission, several works also study the issue of segregation. However, the types of segregation they consider are different from ours with segregation driven by imperfect empathy. For example, Bisin and Verdier (2000a) study segregation in the marriage market. In their paper, people want to segregate themselves in the marriage market because a homogeneous marriage ensures successful vertical transmission. Moreover, since parents have imperfect empathy, they prefer their children to adopt their own preferences; engaging in homogeneous marriage is the most efficient way to achieve such a goal. In addition, Bisin and Verdier (2001) and Saez Marti and Sjögren (2008) study segregation in cultural transmission. When parents with imperfect empathy consider the possible peer effects faced by their children, the parents would like to reduce the probability that his child meet a role model from the opposite group.

This inequality is obtain by inequality (14) in Proposition 2 when $\sigma_0 = 1$. One can see that if $TSF(\theta_L, \theta_L)$ is sufficiently small, inequality (24) fails to hold. In other words, if the alternative preference group's preference θ_L induces sufficiently low economic outcome by self-matching, the majority's preference θ_H cannot be prevalent.

This example demonstrates that local segregation can be conducive in inducing efficiency in more exclusive political institutions because it serves as a defensive mechanism for alternative preference groups whose preference traits are associated with more favorable economic outcomes, but are exploited in political institutions. However, in more inclusive political institutions, it is not necessary the case. Therefore, it is important for policy makers to incorporate preference evolution to evaluate the phenomena such as middleman minorities and ethnic enclaves.

6 Conclusion

In this paper, we seek to answer two questions. The first question is how conducive different political institutions are to spreading preferences that induce efficiency. To do so, we develop a framework in which preference evolution serves as the key channel relating political institutions and the corresponding long-run economic outcomes in different societies. We employ the concept of locally evolutionarily stable preference (LESP) to study whether a small change in the distribution of preferences (a small alternative preference group emerges), can create a new thriving preference trait or merely one that get quickly assimilated in the society. Second, we look at the local segregation problem of the alternative preference group and study how local segregation affects productivity in a society.

Our results suggest that in more exclusive political institutions, all preferences are locally evolutionary stable. Therefore, a society can be locked in state in which all the members of the society have homogeneous preference that corresponds to unfavorable economic outcomes. On the other hand, preference evolution has stronger selection power under more inclusive political institutions and only preference traits that locally have the biggest comparative advantage of being a boss instead of being a worker can be locally evolutionary stable. However, it does not imply that preferences that induce the highest average payoff for the whole society can always be prevalent. Therefore, the relationship between political institutions and efficiency is subtle and one needs to consider the presence of preference evolution.

There are two widely discussed views of growth theory in the literature. The first view roots in Solow (1956), who emphasizes that technological change is the engine of long run growth. The second view sterns from Lewis (1954), who links poverty to resource misallocation. In our model, the primary function of the political institution is determining the allocation of one particular type of scarce resources, high positions in the social hierarchy. The allocation of high positions in turn determines the adoption of new technology, since it may be endogenously generated by the interaction of agents with different preferences. The results in this paper may contribute to unifying these two major views of growth theory from an evolutionary perspective.

We observe that immigrant groups in the history were usually the disadvantaged groups in politics. However, some of them had strong economic performances and have been able to preserve their own cultural identities, while other groups have not. To explain this phenomenon, we let the segregation of the labor market be endogenously determined by the political leaders from the alternative preference group. We show that different political institutions give distinctly different motivations for the political leaders to do so. Moreover, this local segregation behavior can affect a society's long run economic trajectory in a non-trivial way through preference evolution, depending on the type of political institution in the society.

The framework we establish is one way to understand the impacts of political institutions on the evolutionary process of preferences and the corresponding economic consequences. It can be extended in many directions. First, we assume that the positions in the social hierarchy is not heritable. However, in reality, stickiness in upward social mobility usually roots in the heritability of certain positions in the social hierarchy. Hence, it would be an exciting and challenging direction for future research to enrich the cultural transmission mechanism to allow the heritability of positions and study its consequence on preference evolution. Second, the primary function of political institutions we examine in this paper is that of determining the allocation of positions in the social hierarchy, because we believe that this function has non-negligible influence on preference evolution. Nevertheless, political institutions also have other important functions such as fiscal policies and legal enforcement. Therefore, studying how multiple functions of political institution affect the evolutionary process of preferences would be an interesting topic. Third, in the discussion of political bargaining, we assume that the bargaining powers of different groups are exogenously given. However, distribution of bargaining powers in one generation may be endogenously determined by the economic outcomes generated from the previous generation and other primitives of the members in a society such as political ideologies. Therefore, incorporating an endogenously generated dynamic of political institutions into the study of preference evolution serves as an important research avenue for the future.

Appendix

Proof of Lemma 1

We first prove the necessary part. It is equivalent to prove the contrapositive of the statement.

If there is a $\theta' \neq \theta$, such that $\lim_{\mu\to 0} F(\mu, \sigma(\mu), k(\mu)) < \lim_{\mu\to 0} G(\mu, \sigma(\mu), k(\mu))$, We can always find a $\overline{\mu}$, such that for all $\mu \in [0, \overline{\mu})$, $F(\mu, \sigma(\mu), k(\mu)) < G(\mu, \sigma(\mu), k(\mu))$.

Recall that the preference evolution dynamic is given as:

$$\mu_{t+1} = \mu_t + (1-\mu_t)P_t^{\theta\theta'}(x^*(\mu_t, \theta)) - \mu_t P_t^{\theta'\theta}(x^*(\mu_t, \theta')).$$

Suppose at time t, the size of the mutant group μ_t is in the interval $[0, \overline{\mu})$, then we know that $F(\mu_t, \sigma(\mu), k(\mu_t)) < G(\mu_t, \sigma(\mu), k(\mu_t))$. The optimal effort level of a majority parent is $x^*(\mu_t, \theta) = 0$ in this case, since he has no incentive to inculcate his own preference into his child given the alternative preference group's experted material payoff is higher. On the other hand, the optimal effort level of a alternative preference group parent is $x^*(\mu_t, \theta') > 0$.

Hence, $P_t^{\theta\theta'}(x^*(\mu_t, \theta)) = (1-d(\mu_t, x^*(\mu_t, \theta)))\mu_t = \mu_t$, $P_t^{\theta'\theta}(x^*(\mu_t, \theta')) = (1-d(\mu_t, x^*(\mu_t, \theta')))(1-\mu_t) < (1-\mu_t)$. This implies that $(1-\mu_t)P_t^{\theta\theta'}(x^*(\mu_t, \theta)) = (1-\mu_t)\mu_t > \mu_t P_t^{\theta'\theta}(x^*(\mu_t, \theta'))$. In other words, the inflow of the alternative preference group outweighs the outflow of the alternative preference group.

Therefore, for any $\mu_0 > 0$, as long as the dynamic reaches a state $\mu \in [0, \overline{\mu})$ at a finite time t, we have $\mu_{t+1} > \mu_t$. Hence, the dynamic will never converge to 0. To conclude, θ is not an ESP.

Next, we prove the sufficient part. If for all $\theta' \neq \theta$, $\lim_{\mu\to 0} F(\mu, \sigma(\mu), k(\mu)) > \lim_{\mu\to 0} G(\mu, \sigma(\mu), k(\mu))$, then we can find a $\overline{\mu}_0$ such that, for all $\mu \in [0, \overline{\mu}_0)$, $F(\mu, \sigma(\mu), k(\mu)) > G(\mu, \sigma(\mu), k(\mu))$.

Using the similar logics, we know $\mu_{t+1} < \mu_t$ if and only if $F(\mu, \sigma(\mu), k(\mu)) > G(\mu, \sigma(\mu), k(\mu))$. Therefore, for all $\mu_0 \in [0, \overline{\mu}_0)$, $\mu_{t+1} < \mu_t$, for any $t \geq 0$, which means that the dynamic converges to 0. Hence, θ is an ESP. *Q.E.D.*

Proof of Proposition 2

Given $\sigma_0 \in [0, 1)$, the largest k_0^* that the majority can obtain from majoritarianism satisfies:

$$(\frac{1}{2} - k_0^*) - (\frac{1}{2} + k_0^*)\sigma_0 = 0,$$

which implies that $k_0^* = \frac{1-\sigma_0}{2(1+\sigma_0)}$. Plug this into the limit expression of average material payoff for the alternative preference group shown in equation (9) and take the limit of θ' to θ, we have:

$$\lim_{\theta'\to\theta}\lim_{\mu\to 0} G(\mu, \sigma(\mu), k^*(\mu)) \quad = \quad \lim_{\theta'\to\theta}(\frac{\sigma_0}{1+\sigma_0}(V_h(\theta', \theta') + V_l(\theta', \theta')) + \frac{1-\sigma_0}{1+\sigma_0}V_l(\theta, \theta'))$$

$$= \frac{\sigma_0}{1+\sigma_0} V_h(\theta,\theta) + \frac{1}{1+\sigma_0} V_l(\theta,\theta)$$

Since $\sigma_0 \in [0,1)$, we know $\frac{\sigma_0}{1+\sigma_0} < \frac{1}{2}$ and $\frac{1}{1+\sigma_0} > \frac{1}{2}$. Therefore, the alternative preference group's average material payoff is lower than that of the majority as long as θ' is close enough to θ. *Q.E.D.*

Proof of Lemma 2

$$\begin{aligned} \lim_{\mu\to 0}(1-\mu)F_k(\mu,\sigma(\mu),k(\mu,\theta,\theta')) &= [\sigma_0(V_h(\theta,\theta)+V_l(\theta,\theta)) + (1-\sigma_0)V_h(\theta,\theta') - (1+\sigma_0)V_l(\theta',\theta)], \\ \lim_{\mu\to 0} -\mu G_k(\mu,\sigma(\mu),k(\mu,\theta,\theta')) &= (1+\sigma_0)V_h(\theta',\theta) - \sigma_0(V_h(\theta',\theta') + V_l(\theta',\theta')) - (1-\sigma_0)V_l(\theta,\theta'). \end{aligned}$$

Hence,

$$\begin{aligned} \lim_{\theta'\to\theta}\lim_{\mu\to 0}(1-\mu)F_k(\mu,\sigma(\mu),k(\mu,\theta,\theta')) &= V_h(\theta,\theta) - V_l(\theta,\theta), \\ \lim_{\theta'\to\theta}\lim_{\mu\to 0} -\mu G_k(\mu,\sigma(\mu),k(\mu,\theta,\theta')) &= V_h(\theta,\theta) - V_l(\theta,\theta). \end{aligned}$$

Hence, given that Assumption [A1] holds, we would have $\lim_{\mu\to 0}(1-\mu)F_k(\mu,\sigma(\mu),k(\mu,\theta,\theta')) > 0$ and $\lim_{\mu\to 0} -\mu G_k(\mu,\sigma(\mu),k(\mu,\theta,\theta')) > 0$, if θ' is close enough to θ. *Q.E.D.*

Proof of Proposition 3

To prove the sufficient part, we first derive the expression for $k_0^*(\theta,\theta')$ from the first order condition as follows:

$$\begin{aligned} k_0^*(\theta,\theta') = \quad & -\frac{\lim_{\mu\to 0} F(\mu,\sigma(\mu),0)\lim_{\mu\to 0}\mu G_k(\mu,\sigma(\mu),k(\mu,\theta,\theta'))}{\lim_{\mu\to 0}(1-\mu)F_k(\mu,\sigma(\mu),k(\mu,\theta,\theta'))\lim_{\mu\to 0}\mu G_k(\mu,\sigma(\mu),k(\mu,\theta,\theta'))}. \\ & -\frac{\lim_{\mu\to 0} G(\mu,\sigma(\mu),0)\lim_{\mu\to 0}(1-\mu)F_k(\mu,\sigma(\mu),k(\mu,\theta,\theta'))}{\lim_{\mu\to 0}(1-\mu)F_k(\mu,\sigma(\mu),k(\mu,\theta,\theta'))\lim_{\mu\to 0}\mu G_k(\mu,\sigma(\mu),k(\mu,\theta,\theta'))}. \end{aligned}$$

We plug this expression of $k_0^*(\theta,\theta')$ into the expression of $\lim_{\mu\to 0} G(\mu,\sigma(\mu),k^*(\mu,\theta,\theta'))$, we have

$$\begin{aligned} \lim_{\mu\to 0} G(\mu,\sigma(\mu),k^*(\mu,\theta,\theta')) &= \lim_{\mu\to 0} G(\mu,\sigma(\mu),0) + \lim_{\mu\to 0}\mu G_k(\mu,\sigma(\mu),k(\mu,\theta,\theta'))k_0^*(\theta,\theta') \\ &= \lim_{\mu\to 0} F(\mu,0)\frac{-\lim_{\mu\to 0}\mu G_k(\mu,\sigma(\mu),k(\mu,\theta,\theta'))}{\lim_{\mu\to 0}(1-\mu)F_k(\mu,\sigma(\mu),k(\mu,\theta,\theta'))}. \end{aligned}$$

Therefore, if $\exists\delta > 0$, such that $\forall\theta' \in B(\theta,\delta)\backslash\{\theta\}$, we have $\lim_{\mu\to 0}(1-\mu)F_k(\mu,\sigma(\mu),k(\mu,\theta,\theta')) > \lim_{\mu\to 0} -\mu G_k(\mu,\sigma(\mu),k(\mu,\theta,\theta'))$, then

$$\lim_{\mu\to 0} F(\mu,\sigma(\mu),k^*(\mu,\theta,\theta')) = \lim_{\mu\to 0} F(\mu,\sigma(\mu),0) > \lim_{\mu\to 0} G(\mu,\sigma(\mu),k^*(\mu,\theta,\theta')), \text{ for any } \theta' \in B(\theta,\delta)\backslash\{\theta\}.$$

Next, we prove the necessary part, which is equivalent to prove the contrapositive of the statement. Assume that for any $\delta > 0$, one can find a $\theta' \in B(\theta,\delta)\backslash\{\theta\}$, such that $\lim_{\mu\to 0}(1-\mu)F_k(\mu,\sigma(\mu),k(\mu,\theta,\theta')) < \lim_{\mu\sigma(\mu),\to 0}\mu G_k(\mu,k(\mu,\theta,\theta'))$, then we know that

$$\lim_{\mu\to 0} F(\mu,\sigma(\mu),k^*(\mu,\theta,\theta')) < \lim_{\mu\to 0} G(\mu,\sigma(\mu),k^*(\mu,\theta,\theta')), \text{ for this } \theta'.$$

This implies that one can always find $\theta' \neq \theta$ that is arbitrarily close to θ and yields a higher average material payoff than θ. Therefore, the majority's preference θ cannot be locally stable. *Q.E.D*

Proof of Lemma 3

Here we only prove the first case. The other two cases follow similar logics. Recall that the first order condition of the Nash bargaining problem reduces to:

$$\begin{aligned} & q_0 \times \frac{(\frac{1}{2}V_h(\theta,\theta)+\frac{1}{2}V_l(\theta,\theta))((1+\sigma_0)V_h(\theta',\theta)-\sigma_0(V_h(\theta',\theta')+V_l(\theta',\theta'))-(1-\sigma_0)V_l(\theta,\theta'))}{[\sigma_0(V_h(\theta,\theta)+V_l(\theta,\theta))+(1-\sigma_0)V_h(\theta,\theta')-(1+\sigma_0)V_l(\theta',\theta)]} \\ = \; & [\sigma_0(\frac{1}{2}V_h(\theta',\theta')+\frac{1}{2}V_l(\theta',\theta'))+(1-\sigma_0)(\frac{1}{2}V_h(\theta',\theta)+\frac{1}{2}V_l(\theta,\theta'))] \\ & +[\sigma_0(V_h(\theta',\theta')+V_l(\theta',\theta'))-(1+\sigma_0)V_h(\theta',\theta)+(1-\sigma_0)V_l(\theta,\theta')]k_0^*(\theta,\theta'). \end{aligned}$$

We know that

$$\begin{aligned} \lim_{\mu\to 0} F(\mu,\sigma(\mu),0) &= \frac{1}{2}(V_h(\theta,\theta)+V_l(\theta,\theta)), \\ \lim_{\mu\to 0} G(\mu,\sigma(\mu),0) &= \sigma_0\frac{1}{2}(V_h(\theta',\theta')+V_l(\theta',\theta'))+(1-\sigma_0)(\frac{1}{2}V_h(\theta',\theta)+\frac{1}{2}V_l(\theta,\theta')). \end{aligned}$$

Therefore, we can rewrite the first order condition as:

$$\begin{aligned} & q_0 \times \frac{-\lim_{\mu\to 0} F(\mu,\sigma(\mu),0)\lim_{\mu\to 0}\mu G_k(\mu,\sigma(\mu),k(\mu,\theta,\theta'))}{\lim_{\mu\to 0}(1-\mu)F_k(\mu,\sigma(\mu),k(\mu,\theta,\theta'))} \\ & = \lim_{\mu\to 0} G(\mu,\sigma(\mu),0)+\lim_{\mu\to 0}\mu G_k(\mu,\sigma(\mu),k(\mu,\theta,\theta'))k_0^*(\theta,\theta'). \end{aligned}$$

Hence, when $\lim_{\mu\to 0}\mu G_k(\mu,\sigma(\mu),k(\mu,\theta,\theta')) < 0$, we have $k_0^*(\theta,\theta') > 0$ if

$$q_0 < -\frac{\lim_{\mu\to 0} G(\mu,\sigma(\mu),0)\lim_{\mu\to 0}(1-\mu)F_k(\mu,\sigma(\mu),k(\mu,\theta,\theta'))}{\lim_{\mu\to 0} F(\mu,\sigma(\mu),0)\lim_{\mu\to 0}\mu G_k(\mu,\sigma(\mu),k(\mu,\theta,\theta'))} = \hat{M}(\theta,\theta').$$

In addition, since

$$\begin{aligned} \lim_{\theta'\to\theta}\lim_{\mu\to 0} F(\mu,\sigma(\mu),0) &= \lim_{\theta'\to\theta}\lim_{\mu\to 0} G(\mu,\sigma(\mu),0) = \frac{1}{2}(V_h(\theta,\theta)+V_l(\theta,\theta)), \\ \lim_{\theta'\to\theta}\lim_{\mu\to 0}(1-\mu)F_k(\mu,\sigma(\mu),k(\mu,\theta,\theta')) &= -\lim_{\theta'\to\theta}\lim_{\mu\to 0}\mu G_k(\mu,\sigma(\mu),k(\mu,\theta,\theta')) = V_h(\theta,\theta)-V_l(\theta,\theta). \end{aligned}$$

We have $\lim_{\theta' \to \theta} \hat{M}(\theta, \theta') = 1$. *Q.E.D.*

Proof of Lemma 4

By Lemma 2, $\lim_{\mu \to 0}(1-\mu)F_k(\mu, \sigma(\mu), k(\mu, \theta, \theta')) > 0$ and $\lim_{\mu \to 0} -\mu G_k(\mu, \sigma(\mu), k(\mu, \theta, \theta')) > 0$. Therefore, we can apply Lemma 3.

When $q_0 < 1$, since $\lim_{\theta' \to \theta} \hat{M}(\theta, \theta') = 1$, for any $\theta \in \Theta$, we can find a $\delta > 0$, such that $q_0 < \hat{M}(\theta, \theta')$ for any $\theta' \in B(\theta, \delta) \backslash \{\theta\}$. By Lemma 3, we know that $k_0^*(\theta, \theta') > 0$ for $\theta' \in B(\theta, \delta) \backslash \{\theta\}$. *Q.E.D.*

Proof of Proposition 4

For any $\theta \in \Theta$, we have

$$\begin{aligned}
\lim_{\theta' \to \theta} \lim_{\mu \to 0} F(\mu, \sigma(\mu), k^*(\mu, \theta, \theta')) &= \frac{1}{2}(V_h(\theta, \theta) + V_l(\theta, \theta)), \\
\lim_{\theta' \to \theta} \lim_{\mu \to 0} G(\mu, \sigma(\mu), k^*(\mu, \theta, \theta')) &= (\frac{1}{2} + \lim_{\theta' \to \theta} k_0^*(\theta, \theta'))\sigma_0(V_h(\theta, \theta) + V_l(\theta, \theta)) \\
&\quad +((\frac{1}{2} - \lim_{\theta' \to \theta} k_0^*(\theta, \theta')) - (\frac{1}{2} + \lim_{\theta' \to \theta} k_0^*(\theta, \theta'))\sigma_0)V_h(\theta, \theta) \\
&\quad +(\frac{1}{2} + \lim_{\theta' \to \theta} k_0^*(\theta, \theta'))(1-\sigma_0)V_l(\theta, \theta) \\
&= (\frac{1}{2} - \lim_{\theta' \to \theta} k_0^*(\theta, \theta'))V_h(\theta, \theta) + (\frac{1}{2} + \lim_{\theta' \to \theta} k_0^*(\theta, \theta'))V_l(\theta, \theta).
\end{aligned}$$

Lemma 4 states that under assumption [A1], if $q_0 < 1$, $\exists \delta > 0$ such that $\forall \theta' \in B(\theta, \delta) \backslash \{\theta\}$, $k_0^*(\theta, \theta') > 0$. Hence, we have $\lim_{\theta' \to \theta} \lim_{\mu \to 0} F(\mu, k^*(\mu, \theta, \theta')) > \lim_{\theta' \to \theta} \lim_{\mu \to 0} G(\mu, k^*(\mu, \theta, \theta'))$. This implies that one can find a $\delta' \in (0, \delta)$ such that, for all $\theta' \in B(\theta, \delta') \backslash \{\theta\}$, the sufficient condition (10) in Lemma 1 holds. Hence, any $\theta \in \Theta$ is a LESP. *Q.E.D.*

Proof of Proposition 5

For any $\theta' \in S(\theta, q_0)/\{\theta\}$, by definition, both groups would benefit from getting more high positions. This in turns implies that $k_0^*(\theta, \theta')$ is weakly decreasing in q_0 (only when $k_0^*(\theta, \theta')$ reaches its upper boundary $\frac{1}{2}$, it cannot increase any more when q_0 decreases). Hence, if a majority with θ can assimilate an alternative preference group with $\theta' \in S(\theta, q_0^2)$, it can still assimilate the alternative preference group with the same θ' given bargaining power $q_0^1 < q_0^2$, since the majority can get more high positions. This implies that $S(\theta, q_0^2) \subseteq S(\theta, q_0^1)$. *Q.E.D.*

Proof of Proposition 7

In a political institution with majoritarianism, as long as the majority's preference θ is close to the alternative preference group's preference θ', the majority would always want to obtain as many high positions as possible and set $k_0^* = \frac{1-\sigma_0}{2(1+\sigma_0)}$ as shown in the proof of Proposition 2. Given this, when μ converges to zero, the alternative preference group's average material payoff equals

$$\lim_{\mu\to 0} G(\mu, \sigma(\mu), k(\mu)) = \frac{\sigma_0}{1+\sigma_0}(V_h(\theta', \theta') + V_l(\theta', \theta')) + \frac{1-\sigma_0}{1+\sigma_0} V_l(\theta, \theta'),$$

which is an increasing function of σ_0, as long as θ' and θ are close. Hence, the alternative preference group would always want to increase segregation. *Q.E.D.*

Proof of Proposition 8

Since we know from the previous results, in the egalitarian bargaining model, when θ' is sufficiently close to θ, the Nash bargaining problem has a unique interior solution. Hence, in political bargaining with uneven bargaining power, one can always find $0 < \overline{q}_0 < 1$, such that for any $\overline{q}_0 < q_0 \leq 1$, the Nash bargaining problem still has a unique interior solution. In this case, one can write the average material payoff of the alternative preference group when $\mu \to 0$ as follows:

$$\lim \mu \to 0 G(\mu, \sigma(\mu), k^*(\mu)) = \frac{1}{2}(V_h(\theta, \theta) + V_l(\theta, \theta)) \frac{-q_0 \lim_{\mu\to 0} \mu G_k(\mu, \sigma(\mu)}{\lim_{\mu\to 0}(1-\mu) F_k(\mu, \sigma(\mu)}.$$

If we take the derivatives of the marginal benefit of getting more high positions for the two groups with respect to $\sigma(\mu)$, we have

$$\begin{aligned} \lim_{\mu\to 0}(1-\mu)\frac{\partial}{\partial\sigma(\mu)} F_k(\mu, \sigma(\mu), k(\mu)) &= V_h(\theta, \theta) + V_l(\theta, \theta) - (V_h(\theta, \theta') + V_l(\theta, \theta')); \\ -\lim_{\mu\to 0} \mu \frac{\partial}{\partial\sigma(\mu)} G_k(\mu, \sigma(\mu), k(\mu)) &= V_h(\theta', \theta) + V_l(\theta, \theta') - (V_h(\theta', \theta') + V_l(\theta', \theta')). \end{aligned}$$

One can see that when

$$V_h(\theta, \theta') + V_l(\theta', \theta) > V_h(\theta, \theta) + V_l(\theta, \theta), \text{ and } V_h(\theta', \theta) + V_l(\theta, \theta') > V_h(\theta', \theta') + V_l(\theta', \theta'),$$

the average material payoff of the alternative preference group is an increasing function of $\sigma(\mu)$, when μ is sufficiently small. Hence, the alternative preference group would benefit from increasing segregation. On the contrary, when

$$V_h(\theta, \theta') + V_l(\theta', \theta) < V_h(\theta, \theta) + V_l(\theta, \theta), \text{ and } V_h(\theta', \theta) + V_l(\theta, \theta') < V_h(\theta', \theta') + V_l(\theta', \theta'),$$

the average material payoff of the alternative preference group is an decreasing function of $\sigma(\mu)$, when μ is sufficiently small. Hence, the alternative preference group cannot benefit from increasing segregation. *Q.E.D*

References

Acemoglu, D., Johnson, S. and J. Robinson, (2001) "The Colonial Origins of Comparative Development: An Empirical Investigation." American Economic Review, 91(5): 1369-1401.

Acemoglu, D., Johnson, S. and J. Robinson, (2002) "Reversal of Fortune: Geography and Institutions in the Making of the Modern World Income Distribution." Quarterly Journal of Economics, 117(4): 1231-1294.

Acemoglu, D. and J. Robinson, (2000) "Political Losers as a Barrier to Economic Development." American Economic Review: Papers and Proceedings, 90(2), 126-130.

Acemoglu, D. and J. Robinson, (2006a) "Economic Origins of Dictatorship and Democracy." Cambridge University Press, New York.

Acemoglu, D. and J. Robinson, (2006b) "De Facto Political Power and Institutional Persistence." American Economic Review: Papers and Proceedings, 96(2), 325-330.

Acemoglu, D. and J. Robinson, (2006c) "Economic Backwardness in Political Perspective." American Political Science Review, 100(1), 115-131.

Acemoglu, D. and J. Robinson, (2008) "Persistence of Power, Elites, and Institutions." American Economic Review, 98(1), 267-293.

Acemoglu, D. and J. Robinson, (2012) "Why Nations Fail: The Origins of Power, Prosperity, and Poverty." Crown Publishers.

Akerlof, G., (1982) "Labor Contracts as Partial Gift Exchange. Quarterly Journal of Economics, 97: 543-69.

Alger, I., (2010) "Public Goods Games, Altruism, and Evolution". Journal of Public Economic Theory, 12(4), 789-813.

Alger, I. and J. W. Weibull, (2010) "Kinship, Incentives, and Evolution." American Economic Review, 100, 1725-1758.

Alger, I. and J. W. Weibull, (2012) "A Generalization of Hamilton's Rule - Love The Sibling How Much?" Journal of Theoretical Biology, 299, 42-54.

Alger, I. and J. W. Weibull, (2013) "Homo Moralis - Preference evolution under incomplete information and assortative matching" Econometrica, forthcoming.

Akçay E., Van Cleve J., Feldman M. and J. Roughgarden, (2009) "A Theory for the Evolution of Other-regard Integrating Proximate and Ultimate Perspectives." Proceedings of the National Academy of Sciences, 106: 19061-19066.

Austin-Smith, D., (1987) "Interest Groups, Campaign Contributions, and Probabilistic Voting."

Public Choice 54, 123-139.

Banfield, E., (1958) "The Moral Basis of a Backward Society" Free Press, Glencoe, IL.

Bergstrom, T. C., (2003) "The Algebra of Assortative Encounters and the Evolution of Cooperation." International Game Theory Review, 5(3):211-228.

Becker, G., (1983) "A Theory of Competition Among Pressure Groups for Political Influence." Quaterly Journal of Economics 98, 371-399.

Besley, T. and T. Persson, (2011) "Pillars of Prosperity: The Political Economics of Development Clusters." Princeton University Press, Princeton and Oxford.

Bester, H and W. Güth, (1998) "Is Altruism Evolutionarily Stable?" Journal of Economic Behavior and Organization, 34:193-209.

Bisin, A. and T. Verdier, (2000a) ""Beyond The Melting Pot": Cultural Transmission, Marriage, And The Evolution Of Ethnic And Religious Traits." The Quarterly Journal of Economics, volume 115(3), pages 955-988.

Bisin, A. and T. Verdier, (2000b) " A Model of Cultural Transmission, Voting and Political Ideology." European Journal of Political Economy, 16: 5-29.

Bisin, A. and T. Verdier, (2001a) "Agent with imperfect empathy may survive natural selection." Economics Letters, 71, 277-285.

Bisin, A. and T. Verdier, (2001b) "The Economics of Cultural Transmission and the Dynamics of Preferences." Journal of Economic Theory, volume 97(2), pages 298-319.

Bisin, A. and T. Verdier, (2005) "Work Ethic and Redistribution: A Cultural Transmission Model of the Welfare State." Mimeo, New York University.

Boyd R. and P.J. Richerson, (1985) "Culture and the Evolutionary Process." The University of Chicago Press, Chicago.

Boyd R. and P.J. Richerson, (2005) "The Origin and Evolution of Cultures." Oxford University Press, New York.

Buchanan, j., Tollison, R. and G. Tullock, (1980) "Toward a Theory of the Rent-Seeking Society." Texas A&M Press, College Station, Texas.

Cavalli-Sforza L.L and M.W. Feldman, (1981) "Cultural Transmission and Evolution: A Quantitative Approach." Princeton University Press, Princeton, NJ.

Charness G. and M. Dufwenberg, (2006) "Promises and Partnership." Econometrica, Volume 74, Issue 6,1579-1601.

Congleton R., (1986) "Rent Seeking Aspects of Political Advertising." Public Choice 49, 249-263.

Congleton R., (2011) "Perfecting Parliament: Constitutional Reform, Liberalism and the Rise of

Western Democracy." Cambridge University Press, New York.

Dekel, E., Ely, J. C. and O. Yilankaya, (2007) "Evolution of Preferences." Review of Economics Studies, 74, 685-704.

Dixit, A., (2009) "Socializing Education and Pro-Social Preferences" mimeo, Princeton University.

Durante, R., (2009) "Risk, Cooperation and the Economic Origins of Social Trust: An Empirical Investigation." mimeo, Brown University.

Fehr, E. and K. M. Schmidt, (1999) "A Theory of Fairness, Competition and Cooperation." Quarterly Journal of Economics, 114, 817-868.

Fehr, E., Klein, A. and K. M. Schmidt, (2007) "Fairness and Contract Design." Econometrica 75(1), 121-154.

Francois, P. and J. Zabojnik, (2005) "Trust, Social Capital, and Economic Development." Journal of the European Economic Association 3(1): 51–94.

Gradstein, M. and M. Justman, (2002) "Social Cohesion and Growth." American Economic Review. 92: 1192-1204.

Gradstein, M. and M. Justman, (2005) "The Melting Pot and School Choice." Journal of Public Economics. 89 (56): 871-896.

Guiso, L., Sapienza, P. and L. Zingales, (2008) "Social Capital and Good Culture." Marshall Lecture, Journal of European Economic Association 6 (23): 295-320.

Güth, W., (1995) "An Evolutionary Approach to Explaining Cooperative Behavior by Reciprocal Incentives." International Journal of Game Theory, 24: 323-344.

Güth, W. and M. Yaari, (1992) "An Evolutionary Approach to Explain Reciprocal Behavior in a Simple Strategic Game." in U. Witt. Explaining Process and Change - Approaches to Evolutionary Economics. Ann Arbor: Univerisity of Michigan Press.

Hackman, J.J., (2011) "The American Family in Black and White: A Post-Racial Strategy for Improving Skills to Promote Equality." Daedalus, 140(2): 70-89.

Heifetz, A., Shannon C. and Y. Spiegel, (2007a) "The Dynamic Evolution of Preferences." Economic Theory, 32: 251-286.

Heifetz, A., Shannon C. and Y. Spiegel, (2007b) "What to Maximize if You Must" Journal of Economic Theory, 133: 31-57.

Hirschman C., and M. Wong, (1986) "The Extraordinary Educational Attainment of Asian-Americans: A Search for Historical Evidence and Explanations." Social Forces, 65 (1): 1-27.

Kuran, T. and W. H. Sandholm, (2008) "Cultural Integration and Its Discontents." Review of Economic Studies 75: 201-228.

Landes, D., (1998) "The Wealth and Poverty of Nations: Why Some Are So Rich and Some So Poor." New York: W.W. Norton.

Laibson, D., (1997) "Golden Eggs and Hyperbolic Discounting." Quarterly Journal of Economics 112(2): 443-477.

Lewis, A., (1954) "Economic Development with Unlimited Supplies of Labour." The Manchester School, 22: 129-191.

Ljunge, M., (2010) "Sick of the Welfare State? Lagged Stigma and Demand for Social Insurance." mimeo, University of Copenhagen and SITE.

Macleod B., (2013) " On Economics: A Review of Why Nations Fail by D. Acemoglu and J. Robinson and Pillars of Prosperity by T. Besley and T. Persson." Journal of Economic Literautre, 51(1), 116-143.

McNamara, J., Gasson, C. and A. Houston, (1999) "Incorporating Rules for Responding in Evolutionary Games." Nature, 401: 368-371.

North, D., (1990) "Institutions, Institutional Change and Economic Performance." Cambridge University Press, New York.

North, D. and R. Thomas, (1973) "The Rise of the Western World: A New Economic History." Cambridge University Press, Cambridge.

Persson, T. and G. Tabellini, (2000) "Political Economics: Explaining Economic Policy." MIT Press, Cambridge, MA.

Persson, T. and G. Tabellini, (2003) "The Economic Effects of Constitutions." MIT Press, Cambridge, MA.

Olivier, J., Thoenig, M. and T. Verdier, (2008) "Globalization and The Dynamics of Cultural Identity." Journal of International Economics, 76, 356-370.

Olson, M., (1965) "The Logic of Collective Action." Harvard University Press, Cambridge, MA.

Olson, M., (1982) "The Rise and Decline of Nations: Economic Growth, Stagflation and Social Rigidities. Yale University Press, New Haven, CT.

Ok, E. A. and F. Vega-Redondo, (2001) "On the Evolution of Individualistic Preferences: An Incomplete Information Scenario." Journal of Economic Theory, 97, 231-254.

Robson, A., (2001) "The Biological Basis of Economic Behavior." Journal of Economic Literature, 29, 11-33.

Robson, A. and L. Samuelson, (2011) "The Evolutionary Foundations of Preferences." Handbook of Social Economics. Edited by Alberto Bisin and Matt Jackson, North-Holland. 221-310.

Roemer, J., (2006) "Democracy, Education, and Equality." Cambridge University Press, New York.

Saez Marti and Sjögren(2008) "Peers and Culture." Scandinavian Journal of Economics, Wiley Blackwell, Volume 110(1), 73-92, 03.

Sandholm, W. H., (2011) "Population Games and Evolutionary Dynamics." MIT Press, Massachusetts.

Sethi, R. and E. Somanathan, (2001) "Preference Evolution and Reciprocity." Journal of Economic Theory, 97: 273-297.

Solow, R., (1956) "A Contribution to The Theory of Economic Growth." Quarterly Journal of Economics, 70(1): 65-94.

Tabellini, G., (2008a) "The Scope of Cooperation: Normes and Incentives" Quarterly Journal Economics, 123 (3): 905-950.

Tabellini, G., (2008b) "Institutions and Culture" Presidential address, Journal of European Economic Association 6 (23): 255-294.

Weber, M., (1896) "The Social Causes of the Decline of Ancient Civilization." The Agrarian Sociology Of Ancient Civilizations, trans. R.I. Frank, Verso, London.

Weber, M., (1930) "The Protestant Ethic and the Spirit of Capitalism." Allen and Unwin, London.

Van Veelen, M., (2006) "Why kin and group selection models may not be enough to explain human other-regarding behaviour." Journal of Theoretical Biology, 242, 790-797.