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Group Identities in Conflicts

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Abstract

We analyze the interplay of group identity and inter-group conflict in a contest where each of two conflicting groups can develop either a group or an individualistic identity. Contest structures impact on the adoption of identities which themselves influence behavior in the contest. We show the following: If group sizes and contest technologies are similar, group identities emerge. This then results in a reduced well-being for all individuals. If one group has a large advantage in the contest, only this group will create a group identity and benefit on the expense of the other. Outgroup hostility favors asymmetric identities. Several applications of the findings are discussed.

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1 Introduction

Norms and group identities shape behavior and performance in inter-group conflicts. The payoff structure in such conflicts creates clear disincentives for individual group members to exert effort: individuals bear the full costs of their efforts (e.g., in opportunities forgone, physical exertion, and risk of death or injury) while the (marginal) benefits associated with success in the conflict are by and large public goods. In the presence of such within-group free-rider problems, groups can be expected to have a competitive advantage in conflicts with other groups if they are able to internalize their intra-group externalities, e.g., by means of formal rules, institutions, norms, or group identities (Bornstein, 2003). Often groups do not have access to formal rules or institutions. In such situations of conflict, a common group identity may be one but potentially very “coarse” way to create norms of group-based altruism and cooperative behavior among group members (see, e.g., Sherif 1966, Akerlof and Kranton 2000, Guiso et al. 2006, Turner and Oakes 1997, Ginges and Atran 2009).

In this paper we focus on the *emergence* of group identities in conflicts between groups. Roughly, a group identity will help to align individual members’ behavior with the overall interest of the group, thus solving internal free-riding problems, but potentially at the cost of an increased outgroup hostility. Our major point is that the emergence or non-emergence of such group identities is contingent on the conflict situation, i.e., on the involved groups’ relative strengths. Group identities are strategic instruments in conflicts rather than innate concepts, and are adopted if their benefits to the group exceed their costs. The benefits result from the (possibly imperfect) alignment of individual behavior with the group’s overall interest: individuals who identify with their group strive harder in the conflict. This may, however, fire back when the opponent group replies by also increasing their contest effort. If the opponent group is sufficiently strong, i.e., if their effort has a higher marginal impact on their likelihood to succeed in the contest, the winning prospects for the first group get bleaker. These are then the potential costs of a group identity. It is, thus, not evident whether a group should adopt a group identity. Rather, this depends on whether the groups’ efforts in the contest are strategic substitutes or complements. In summary, the “identity profile” in inter-group conflicts should be understood as an equilibrium outcome, contingent on the relative strengths of the conflicting parties (as proxied by their size, their contest technology, their available resources, etc.).

There are two important corollaries to this observation: First, groups may not build up a group identity even though this was costless. Foregoing the benefits from a better within-group coordination may pay off for weak groups if it keeps the overall conflict intensity low and, by this, own prospects for succeeding in the contest favorable. Second, as conflicts between groups that have group identities are more intense than conflicts between lesser motivated groups, the adoption of group identities may be socially wasteful: eradicating free-riding within groups acerbates conflicts between groups.

The model we use to arrive at these results and the conditions under which they emerge has two groups competing for a given prize that is shared among group members (if their group is successful in the contest). Such rent-seeking contests among groups exhibit standard externalities within groups: individual group members' efforts increase the winning probability of the whole group while its costs are private.[1] We combine this approach with a model of endogenous social identities that borrows from Shayo (2007, 2009) and Choi and Bowles (2007):[2,3] individual members of both groups can either develop a group identity or an individualistic identity. Individualistic group members only care for their personal material payoff (and act accordingly). By contrast, individuals with a group identity act in the interest of the whole group; they may, in addition, also bear hostility towards the other group (spiteful behavior). Our restriction to these two archetypal identities will be further discussed in Section 3.

Individualistic utility maximization gives rise to within-group externalities, as mentioned above. These externalities can be (partly) overcome if group members have a group identity. Members who have adopted a group identity behave as if they

[1]The literature on contests between groups has recently been surveyed by Corchón (2007), Section 4.2, Garfinkel and Skaperdas (2007), Section 7, and Konrad (2009), Chapters 5.5 and 7.

[2]Shayo (2007) developed a theory of endogenous group identities that is based on a tradeoff between group-status and perceived distance between an individual and the group the individual can potentially identify with. According to this view, individuals tend to identify with high-status groups or individuals, but only if their perceived difference between certain attributes of the individual and the group is sufficiently small. This model unifies a large class of findings ranging from status preferences and conformity to inequality aversion and is sufficiently tractable to be applied in different contexts.

[3]To our knowledge, the only other paper that discusses the role of social identities in contests is Robinson (2001). It analyzes in an informal way conflicting group identities if (as in this paper) the process of identification is costless and perfect.

maximized total group payoffs. We analyze a two-stage game where the members of both groups first develop an identity (either individualistic or group) and then invest effort into a standard rent-seeking contest. It turns out that the structure and welfare of the associated equilibria depends on two factors, relative group size and relative advantage in the technology of conflict.

Our analysis predicts that, if groups are similar (i.e., of comparable sizes and with equally effective conflict technologies), both will adopt a group identity, and both will be worse off compared to a situation with individualistic identities. The prisoners'-dilemma structure results as group identity motivates individuals to invest more in the conflict, which leads to a larger dissipation of the rent. Intra-group incentive effects of identification can, thus, have a dark side – which (only) shows up in an equilibrium context that highlights the symmetry of interests in the creation of identities.[4] If groups are sufficiently dissimilar, only the relatively larger and/or technologically more efficient group develops a group identity, whereas the "underdog" maintains an individualistic identity. The group with the group identity will always profit at the expense of the individualistic one. Relative group size and efficiency both matter for identity choice – but for different reasons: in larger groups, the free-rider problem is more severe, implying that larger groups benefit more from a group identity. Differences in contest technology determine, however, whether investments in the contest are strategic complements or substitutes (in equilibrium): for the relatively more effective group, investments in the contest are strategic complements, whereas they are strategic substitutes for the relatively less effective group. Hence, starting from an equilibrium with individualistic identities in both groups, the stronger group *ceteris paribus* induces the other group to reduce their investments in the contest, whereas the opposite is true for the "underdog". This creates an asymmetry with respect to the gains from identification.

Often within-group solidarity appears to be accompanied by outright hostility towards other groups (Brewer 1999, Tajfel and Turner 1986), dissociation from other groups (Sherif, 1966) or other concerns for relative (rather than absolute) payoffs (Powell 1991, Rousseau, 2002). Under such circumstances, one-sided group identities become even more prominent. If hostility (the motive for dissociation) is sufficiently strong, only equilibria with one-sided group identities survive, with similar prop-

[4]This finding is not restricted to incentives generated by the identification with certain identities but extends to all forms of more standard incentive mechanisms.

erties as just described. Hostility towards the other group makes individuals more aggressive (spiteful behavior); they also benefit from a reduction in the material payoff of the other group. This increases the incentive to invest for the group facing strategic complements, eliminating the set of parameter values for with two-sided group identities may emerge.

We will illustrate the relevance of these abstract observations by a series of examples in Section 2. A short survey of the literature on social identities follows in Section 3. Our two-stage model of conflict and identity choice is introduced and analyzed in Section 4. Section 5 concludes. Proofs are in the Appendix.

2 Applications

Our findings emphasize both the contingencies and the strategic aspects for the development of identities in group conflicts.[5] Real-world conflicts where identities emerge endogenously are numerous, ranging from fighting spirit on military battlefields or in team sports to historical patterns of nationalism to social phenomena on (seemingly) deviant and dysfunctional behavior. Let us illustrate this with a couple of examples.

1. The battlefield: Military theorists have always emphasized the decisive role of "morale" and fighting spirits in wartime.[6] Yet, bravery, perseverance and readiness to make sacrifice are not innate properties of individuals or armies but can rather emerge endogenously from the conflict situation. E.g., Ferguson (2000) argues that the decisive factor during the last months of World War I was the dispersal of fighting spirit within the German troops and society at large (apparent, e.g., in large-scale capitulations, defections, or social and political unrest). This was in marked contrast to the high-spirited and united hurrah of the years before. The change in fighting

[5] In the evolutionary long-run, it appears that groups with more effective means of instilling intra-group altruism in their members prevailed over groups with less effective mechanisms (Bernhard et al., 2006). Our concern here is with specific, short-run conflicts.

[6] Carl von Clausewitz (1873) aptly notes: *"[T]he effects of a victory cannot in any way be explained without taking into consideration the moral impressions [. . .] We might say the physical [causes and effects] are almost no more than the wooden handle, whilst the moral are the noble metal, the real bright-polished weapon."* (On War, Book III, Chapter 3. Quoted from the 1873 translation by J.J. Grabner.)

spirit was largely caused by the expected and then actual entry of the US into the war and the fact that for the first time during the war German casualties outnumbered those of their enemies. In the terminology of our model, this corresponds to a reduction in relative conflict strength which then caused identities to shift from group-oriented to individualistic. Ferguson (2000) concludes that the disintegration of group cohesion and fighting spirit within the German army and society was the consequence, rather than the cause, of military inferiority.

A similar pattern was observed for the end of the American Civil War when the Union became more and more dominant. In the last two years of the war, large-scale desertion in the troops of the Confederacy took place. According to Weitz (2000), Confederate soldiers then fought to defend their families or local states, not a new nation or a Confederate cause. The swing towards more local or private identities endogenously emerged in the conflict when relative conflict strength declined. As predicted by our model, it led to lesser effort in the conflict. Replacing their Confederate, Southern identity with local identities, soldiers lost their motive to fight and, therefore, deserted the army (Bearman 1991).

2. "Nations and Nationalism" (Gellner, 2006[1983]): Equating, on the national level, a group identity with patriotism or nationalism, our model bears historical connotations also on a larger scale. Rather than going through (more or less suitable) single historical examples, parallels can be drawn to the stylized theory of nationalism developed by social anthropologist Ernest Gellner (Gellner, 2006[1983]). From the historical accounts of Poles, Serbs, Czechs, Romanians and various other Eastern European peoples, Gellner distills a stereotyped history of nationalism framed in terms of a fictitious people of Ruritania. In its original state, Ruritania is depicted as a rural society that forms part of the Empire of Megalomania (a historical parallel to the Habsburg Empire of the late 19th and early 20th centuries).

Ruritanians initially do not possess any group identity: they are a collection of people of similar but loosely connected cultural and linguistic ties, do not view themselves as having loyalty or commonalities with their counterparts. This changes with the simultaneous occurrence of a Ruritanian population explosion and an industrial expansion (which mainly benefits Megalomanians) that leads to intense labor migration to the industrial centers of Megalomania. Moreover, *"[a]t the same time, some Ruritanian lads destined for the church, and educated in both the court and the liturgical languages, became influenced by the new liberal ideas, . . . [ending]*

as journalists, teachers, professors. They received encouragement from a few foreign, non-Ruritanian ethnographers, musicologists, and historians who had come to explore Ruritania. The continuing labour migration, increasingly widespread elementary education and conscription provided these Ruritanian awakeners with a growing audience." (Gellner, 2006 [1983], pp. 58f). This eventually leads Ruritanians to exchange their individual identity for a group identity: *"Ruritanians had previously thought and felt in terms of family unit and village ... But now, swept into the melting pot of an early industrial development, ... there were other impoverished and exploited individuals, and a lot of them spoke dialects recognizably similar, while most of the better-off spoke something quite alien; and so the new concept of the Ruritanian nation was born."* (ibid., p. 69)

Translated to our model, this stylized historical process can be understood as a move from a situation with a one-sided group identity (only Megalomania had a national identity) to two-sided group identities. The switch in regimes is triggered by (exogenous) changes in relative population sizes and an improvement in contest technology via better education, influential intellectuals, wider dissemination of ideas etc. As in our model, the Ruritanian adoption of a group identity leads to an intensification of political, social, and economic conflicts within an increasingly ethnicized Megalomanian, Habsburg Empire and to strong calls for political entities geographically congruent with cultural identities (realized after World War I).

While being criticized in particular for deterministically regarding industrialization as the major driver for nationalism (see, e.g., Tambini 1998), Gellner's approach has been fruitfully applied to numerous other cases of nationalism around the world. In addition to supplying a colorful illustration, Gellner's Ruritania theory shares two important general features with our model of identity choice in conflicts. First, group identity is an endogenous variable of choice, not an innate, primordial property. Second, whether and which group identities emerge depends on the specific social environment (the contest situation); changes thereof may lead to different identity regimes.

3. "Dysfunctional" identities: Going back to E. Durckheim (1997 [1951]), anomie theory explains deviant behavior as a reaction to pressures to achieve certain social goals when opportunities to actually succeed are low. According to Merton (1968)'s extension of Durckheim's concept, a proper understanding of group behavior and societies can only be obtained when the dysfunctional aspects of institutions are recognized. He focussed on the question of what keeps social systems dysfunctional. In his view, one group's functioning could induce another group to be dysfunctional, and vice versa. Our model gives a precise meaning to such strategic interdependence between the different groups' determination of identities. Our result that an apparently effective strategy, namely the adoption of a costless group identity, may turn out to be suboptimal from a strategic perspective, shows that there might be some kind of "higher" rationality behind apparently dysfunctional behavioral patterns. An individualistic identity seems to be dysfunctional (only) if one abstracts from the strategic situation a group finds itself into. It may, however, be a functional adaptation to a dominant environment; dysfunctionality may be a way to reduce the competitive pressure from other groups. Strategic considerations of this sort have so far not been discussed in the literature on identities and norms.

For the disaggregate, individual level, Merton (1986) argues that individuals who are unable to succeed react to the implied strain in five possible ways: conformity, innovation, ritualism, retreatism, and rebelion. The third and fourth types of reaction are of specific importance to our analysis. Ritualism is an overconformist form of abandonment in situation of limited chances for success. The pursuit of succeeding in a contest for the achievement of some dominant cultural goal (e.g., economic success, which is inherently a positional good implying a contest structure) is rejected or abandoned. Merton argues that this adaptation is most likely to occur within the lower middle class of American society.[7] According to our model, such a behavior may signal to the dominant group that the individual has lowered his of her aspiration level, taking away some of the competitive pressure in the societal contest for recognition, status etc. Retreatism, the fourth type of reaction in Merton's (1968) anomie theory, involves a complete escape from the pressures and demands of organized society into privacy: *"An individual may move toward retreatism after fully internalizing the cultural goals of success but finding them unavailable through established, institutional means. Internalized pressures prevent the person from adapting through innovation, so, frustrated and handicapped, he or she adopts a defeated and even withdrawn role"* (Clinard and Meier, 2007, p. 73). Retreatism appears to be especially prevalent in the "lower" classes; they experience the greatest gap between the pressure to succeed and the reality of low achievements.

[7]An example is the role behavior of the bureaucratic clerk who, denying any aspirations for advancement, becomes preoccupied with the ritual of doing it "by the book."

3 Social identities and parochial altruism

Our approach rests on the premise that individuals can adopt social identities, a concept that is well established in social psychology. According to Social-Identity Theory (SIT), developed by social psychologists Tajfel and Turner, among others (Tajfel et al. 1971, Tajfel and Turner 1979, 1986, Turner et al. 1987), individual behavior cannot be adequately understood in isolation but has to account for individual's integration in social groups. Individuals who are confronted with identical formal institutions – "rules of the game" in the sense of North (1981) – may act differently, depending on the social context. One of the most important results of SIT is that the creation of a "minimum-group situation" – where individuals are randomly and arbitrarily assigned to groups – suffices to generate identification with the members of this group and antagonism towards members of other groups. The effect even holds if the participants know that they are randomly matched.[8] Also Gellner's theory of nationalism (see previous section), which originally depicted the emergence of nationalism as elite-driven and based on conformity with a high culture, has recently been combined with SIT by arguing that national identification might be almost effortlessly achieved even through simple cultural cues or banal national symbolism (Tyrrell, 2007).

In a theory that strongly underpins the implications of SIT, Choi and Bowles (2007) argue that two patterns of behavioral dispositions are likely to have emerged under the specific circumstances given in late Pleistocene and early Holocene: parochial altruism towards group members and hostility towards outsiders on the

[8] A number of experimental studies has challenged the minimum-group paradigm with mixed evidence so far. Charnes et al. (2007) show that group membership has a significant effect on individual behavior, but that the minimum-group situation alone is not sufficient to generate the effect. Group membership rather has to be salient in order to induce its behavioral consequences. Buchan et al. (2006) show that arbitrary symbols with cheap talk matter for American but not for Chinese players in trust games. Gueth et al. (2008) show that arbitrary symbols without cheap talk do not matter in trust games. Chaserant (2006), on the contrary, shows that group identity and gender make a strong difference in ultimatum games, even in a minimum-group situation. Eckel and Grossman (2006), on the other hand, show that a minimum-group situation is not sufficient to create behavioral effects in public-goods team production but that arbitrary goals that have to be achieved prior to production do the job. In PD experiments with Swiss-army officers, Goette et al. (2006) show that an arbitrary assignment to platoons matters for the feeling of identity for long-term behavioral effects.

one hand (PA-H) and tolerant nonaltruism and restricted aggression (TN-RA) on the other. Biologically, the idea of a co-evolution of parochial altruism on the one hand and outgroup hostility on the other has recently been confirmed by De Dreu et al. (2010), pointing out to the role of the neuropeptide oxytocin in human brains. According to this study, *"[h]umans regulate intergroup conflict through parochial altruism; they self-sacrifice to contribute to in-group welfare and to aggress against competing out-groups. Parochial altruism has distinct survival functions, and the brain may have evolved to sustain and promote in-group cohesion and effectiveness and to ward off threatening out-groups. [Several experiments showed] that oxytocin drives a 'tend and defend' response in that it promoted in-group trust and cooperation, and defensive, but not offensive, aggression toward competing out-groups."* The evolutionary stability of the PA-H and TN-RA allele indicate that either two types of individuals within a population or two types of behavioral dispositions within an individual exist.

These findings show that, compared to formal incentive mechanisms, group identity is a "coarser" instrument to direct the incentives in conflicts because it relies on dispositions shaped by the forces of evolution. Our model reflects this "coareseness" by (only) allowing for two types of identities: a group identity in the sense of PA-H and an individualistic identity in the sense of TN-RA. In addition, we focus on general-equilibrium behavior which allows it to get a more detailed idea about the incentive effects of identities, which distinguishes our approach from, for example Akerlof and Kranton (2000, 2005) who restrict attention to a partial-equilibrium principal-agent model where the identification of the agent with the organization's values serves as a means to align the interests of the principal and the agent.[9] The coexistence of cooperation between group members and hostility towards outsiders induces two motives why individuals would spend effort in inter-group conflicts: they can raise their (or their own group's) material well-being and they can lower the well-being of the other group.

[9]This approach is in line with Coleman (1998[1990]) who sees social norms as results of group-level optimization and Glaeser et al. (2002) who extend human-capital theory to investments in social skills and social interactions.

4 A model of identity in conflicts

4.1 Model primitives

The economy: We build on a model of free-rider behavior in intergroup contests developed by Nitzan (1991). Two groups, A and D, compete for a given rent of value R. This rent is rival in consumption, and the fraction of the rent appropriated by a group is divided equally among its members.[10] Individuals perceive themselves as being identical in all respects except for their group membership. Group $i = A, D$ consists of $N_i > 1$ identical members. A member voluntarily invests an amount a_i ($i = 1, \ldots, N_A$ in group A) or d_i ($i = 1, \ldots, N_D$ in group D) in a contest to appropriate the rent. We denote by $a = \{a_1, \ldots, a_{N_A}\} = \{a_i, a_{-i}\}$ and $d = \{d_1, \ldots, d_{N_D}\} = \{d_i, d_{-i}\}$ the vectors of investments.

The fractions of the rent that are appropriated by groups A and D are given by the generalized Tullock contest-success function

$$p_A(a,d,\theta) = \frac{\theta \cdot \sum_{i=1}^{N_A} a_i}{\theta \cdot \sum_{i=1}^{N_A} a_i + \sum_{i=1}^{N_D} d_i}, \quad \text{and} \quad p_D(a,d,\theta) = \frac{\sum_{i=1}^{N_D} d_i}{\theta \cdot \sum_{i=1}^{N_A} a_i + \sum_{i=1}^{N_D} d_i}.$$

The parameter $\theta > 0$ measures the relative effectiveness of group A relative to group D. This parameter reflects an important aspect of asymmetry between groups in conflicts and will shape identity choices.

Individual preferences: The *material payoff* for members of group A and D is equal to

$$\pi_A^i(a,d,\theta) = \frac{1}{N_A} \cdot p_A(a,d,\theta) \cdot R - a_i, \quad \text{and} \quad \pi_D^i(a,d,\theta) = \frac{1}{N_D} \cdot p_D(a,d,\theta) \cdot R - d_i, \tag{1}$$

respectively. This specification entails a free-rider problem in the following sense. Every individual bears the full costs of its investment decision, but gets only a fraction of the additional rent. Hence, if individuals maximize material payoffs, the incentives to invest in the contest are diluted.

[10] Hence, investments in a group-contest to capture the rent are structurally equivalent to a commons problem (Hardin, 1968). Alternatively we could assume that the rent is a group-specific public good. Qualitatively, our results extend to any other sharing rule that does not adjudge the complete marginal return on the investment to individuals.

The basic idea in the literature on identity is that an individual who adopts a certain identity imposes on itself identity-specific norms that influence its behavior (Akerlof and Kranton 2003, 2005). Shayo (2007, 2009) explains the behavioral consequences of social identities and their endogenous formation as resulting trade-offs between material well-being, group status and perceived distance between individual and group characteristics. Individual preferences are modeled as utility functions $u^i(\pi^i, S^i_j, \Delta^i_j)$ where individual i positively values higher personal material payoffs π^i, a higher (relative) benefit S^i_j for the group j the individual i identifies with (called "status" in Shayo, 2007), and a lower perceived within-group distance Δ^i_j between himself and the group to which it is attached. In our model, such intra-group differences do not play any role and we, thus, do not pursue them any further.[11] We also assume that utility is additively separable between material payoff and group benefits:

$$u^i(\pi^i, S^i_j) = \pi^i + S^i_j. \tag{2}$$

Following Choi and Bowles' (2007) archetypal behavioral dispositions, we assume that each individual (only) has two possible social identities. It can develop parochial altruism with respect to group members and hostility to non-group members (PA-H, which will for short be called a *group identity* in our paper), or it can develop tolerant nonaltruism and restricted aggression (TN-RA, which we call an *individualistic identity*).

In specifying the utility S^i_j from group benefits we assume that an individual with individualistic identity only cares for its material payoff π^i: $S^i_j = 0$ with individualistic identities. In accordance with Shayo (2007) and Choi and Bowles (2007)'s notion of parochial altruism, we assume that if an individual identifies with his group, the interests of the individual are aligned with the interests of the group in the sense of utilitarian group welfare, $\Pi^i_j = \sum_{k \neq i} \pi^k_j$ (for $j = A, D$).[12] As argued by Choi and

[11] The reason why this simplification does not lead to trivial results for the choice of social identities is that the behavioral consequences of different identities and the implied changes in material payoffs differ.

[12] This utilitarian-type parochial altruism is an element of the class of strictly monotonic, welfaristic individualistic welfare functions that all share the property that individual and group incentives are aligned. It is a special case of the general assumption found in Shayo (2007) and Lindquist and Ostling (2007). Charness and Rabin (2002) model social identities as a sort of altruism towards group members in the sense that individuals have Rawlsian preferences.

Bowles (2007), parochial altruism often is associated with outright hostility towards the other group. We model this possible sidekick of a group identity as a preference for dissociation from the other group: in addition to see its own material payoff grow, the individual wishes to see that of the other group decrease. Specifically, we assume that

$$S_j^i = \Pi_j^i - z \cdot \sum_{k=1}^{N_m} \pi_m^k, \quad j, m = A, D; \quad j \neq m,$$

where $z \in [0, 1]$ measures the intensity (identical across groups) of hostility borne against the other group (Tajfel and Turner, 1986). Hostility towards others is akin to a relative-status motive as in Shayo (2007). It gives rise to spiteful behaviour (Hamilton 1970; Kelley and Thibaut, 1978) and adds a relative gains motive to the intergroup game (Rousseau, 2002).

Identities: Individual identities are binary variables $\alpha_i, \delta_i \in \{0, 1\}$ (for group members $i = 1, \ldots, N_A$ of group A and $j = 1, \ldots, N_D$ of group D) where α_i (δ_j) takes on value 1 if a member of group A (D) identifies with its group and zero if it chooses an individualistic identity. We assume that a group identity for the group as a whole only emerges if all members of that group identify with it.[13] Group identities for groups A, D are, thus, binary functions such that

$$\alpha = \begin{cases} 1 & \text{if } \alpha_i = 1 \, \forall i = 1, \ldots, N_A \\ 0 & \text{else,} \end{cases} \quad \text{and} \quad \delta = \begin{cases} 1 & \text{if } \delta_i = 1 \, \forall i = 1, \ldots, N_D \\ 0 & \text{else.} \end{cases} \tag{3}$$

Plugging all this into (2), we can write payoffs as

$$u_A^i = \pi_A^i + \alpha \left(\sum_{k \neq i} \pi_A^k - z \sum_{j=1}^{N_D} \pi_D^j \right), \quad \text{and} \quad u_D^i = \pi_D^i + \delta \left(\sum_{k \neq j} \pi_D^k - z \sum_{j=1}^{N_A} \pi_A^j \right). \tag{4}$$

Via the various π-functions, both u_A^i and u_D^i are functions of investments in the contests (a, d), primitives of the model (especially, θ) and identity choices (α, δ):

$$u_A^i = u_A^i(a, d, \theta, \alpha, \delta) \quad \text{and} \quad u_D^i = u_A^i = u_A^i(a, d, \theta, \alpha, \delta).$$

[13]This assumption buys us a relatively simple optimization problem for given identities. A situation where individuals can choose identities individually makes it necessary to solve the effort subgame for all possible identity choices of individuals despite the fact that – given that all individuals are identical – there exists an equilibrium where all individuals in a given group choose the same identity. We may, of course, lose asymmetric equilibria, which is – given the focus of the paper – of only secondary importance.

The game: We analyze a two-stage game where group members invest in the contest for given identities at the second stage and choose identities at the first stage. Somewhat loosely, an equilibrium is a tuple $\{a^*, d^*, \alpha^*, \delta^*\}$ such that

- for all $i = 1, \ldots, N_A$ and $j = 1, \ldots, N_D$, a_i^* maximizes u_A^i and d_j^* maximizes u_D^j, given the values of $\{\alpha^*, \delta^*\}$, and
- the individual choices of identities α_i, δ_j in the first stage give rise to group identities α^* and δ^* that maximize, respectively, u_A^i and δ^* maximize (4) for members of A and B, anticipating the effects on stage-two behavior.

We will be more specific about the equilibrium concept later.

4.2 Contest behavior with given identities

We now report the outcomes of the second-stage subgame for the four possible identity profiles. We are looking for Nash-equilibrium investment levels of a simultaneous-move (sub-)game and restrict attention to equilibria where (the identical) members of the same group invest the same quantity in equilibrium.[14]

Let us denote by

$$V_A(N_A, N_D, \theta, \alpha, \delta) \quad \text{and} \quad V_D(N_A, N_D, \theta, \alpha, \delta)$$

the subgame equilibrium levels of material individual payoffs π_A^i and π_D^i for members of groups A and D, respectively (the individuals' indexes can be dropped by symmetry within groups). We will use these values as measures for individual well-being in the welfare analysis below. Unlike in Akerlof and Kranton (2000, 2005), a group identity here is not regarded as an intrinsic and potentially welfare-relevant source of utility for the individuals. Rather, a group identity "only" induces behavior that is in the collective interest, irrespectively of what individual benefits are (Ginges and Atran, 2009; Turner and Oakes, 1997). As Fang and Loury (2005), we abstain from assuming "intrinsic" utility gains from identification with a group. The underlying change in preferences would pose severe problems for any normative assessments that rely on the idea of normative individualism. Taking *per-capita* rents

[14]For the investment levels, the individual choices of identity are immaterial; only the group's identity matters. As a consequence, all individuals in a group face identical payoff functions irrespective of their individual identity choices.

as the basis for welfare comparisons avoids problems of changing identities, and the material payoffs of an individual are a good proxy for welfare in this context.[15] Put differently: reporting only V_A and V_D isolates the *behavioral* effects of identity choices: what happens to measurable material outcomes when incentives are shaped in contests by "soft" factors. Individuals behave as if they acted for the group – but, in the end of the day, only material outcomes can be consumed.

There are four cases to be considered:

Case 1: Both groups have an individualistic identity. This standard case with $\alpha = \delta = 0$ has been analyzed by Nitzan (1991). A representative member of group A, D solves the following problem:

$$\max_{a_i} u_A^i(a_i, a_{-i}, d, \theta, 0, 0), \quad \max_{d_i} u_D^i(a, d_i, d_{-i}, \theta, 0, 0).$$

The Nash equilibrium in this subgame is given by

$$\begin{aligned} a_i(N_A, N_D, \theta, 0, 0) &= \frac{N_D R\theta}{N_A(N_A + N_D\theta)^2}, \\ d_i(N_A, N_D, \theta, 0, 0) &= \frac{N_A R\theta}{N_D(N_A + N_D\theta)^2}. \end{aligned} \tag{5}$$

Hence, investments in the conflict are decreasing in the size of the own group: the larger the group, the smaller is the effect of an individual's contribution on the outcome of the game, and the larger is the incentive to free-ride.

In this case, individual payoffs u_j^i coincide in fact with own per-capita material payoffs, π_i^k. They are as follows:

$$\begin{aligned} V_A(N_A, N_D, \theta, 0, 0) &= \frac{N_D R\theta(N_A + N_D\theta - 1)}{N_A(N_A + N_D\theta)^2}, \\ V_D(N_A, N_D, \theta, 0, 0) &= \frac{N_A R(N_A + (N_D - 1)\theta)}{N_D(N_A + N_D\theta)^2}. \end{aligned} \tag{6}$$

Case 2: Only group D has a group identity. With $(\alpha, \delta) = (0, 1)$, representative members of group A and D solve the following problems:

$$\max_{a_i} u_A(a_i, a_{-i}, d, \theta, 0, 1), \quad \text{and} \quad \max_{d_i} u_D(a, d_i, d_{-i}, \theta, 0, 1).$$

[15] The supplement "in this context" is of importance here because (i) the choice of a specific identity can be a major factor for personal well-being and (ii) it is well known from welfare economics that quantitative measures of material well-being (GDP, say) are in general not strictly positively correlated with utility.

The Nash equilibrium for this subgame is given by

$$\begin{aligned} a_i(N_A, N_D, \theta, 0, 1) &= \frac{R\theta(z+1)}{N_A((1+z)N_A+\theta)^2}, \\ d_i(N_A, N_D, \theta, 0, 1) &= \frac{RN_A\theta(z+1)^2}{N_D((1+z)N_A+\theta)^2}. \end{aligned} \tag{7}$$

The associated per-capita material welfare levels are

$$V_A(N_A, N_D, \theta, 0, 1) = \frac{R\theta(N_A+\theta+(N_A-1)z-1)}{N_A((1+z)N_A+\theta)^2}, \tag{8}$$

$$V_D(N_A, N_D, \theta, 0, 1) = \frac{R(N_a^2 N_d(1+z)^2 - N_d\theta^2 z - N_a\theta(1+z)(1+N_d(z-1)+z))}{N_D((1+z)N_A+\theta)^2}.$$

Case 3: only group A has a group identity. The case $(\alpha, \delta) = (1, 0)$ is a perturbation of case 2. Per-capita material welfare levels amount to:

$$\begin{aligned} V_A(N_A, N_D, \theta, 1, 0) &= \frac{R(N_a N_d^2\theta^2(1+z)^2 - N_a z - N_d\theta(1+z)(N_a(z-1)+1+z))}{N_A(N_D\theta(z+1)+1)^2}, \\ V_D(N_A, N_D, \theta, 1, 0) &= \frac{R((N_D-1)\theta(z+1)+1)}{N_D(N_D\theta(z+1)+1)^2}. \end{aligned} \tag{9}$$

Case 4: both groups have a group identity. With $(\alpha, \delta) = (1, 1)$ the individual optimization problems in groups A and D are:

$$\max_{a_i} u_A(a_i, a_{-i}, d, \theta, 1, 1), \quad \text{and} \quad \max_{d_i} u_D(a, d_i, d_{-i}, \theta, 1, 1).$$

In the Nash equilibrium of this subgame,

$$\begin{aligned} a_i(N_A, N_D, \theta, 1, 1) &= \frac{R\theta(z+1)}{N_A(\theta+1)^2}, \\ d_i(N_A, N_D, \theta, 1, 1) &= \frac{R\theta(z+1)}{N_D(\theta+1)^2}, \end{aligned} \tag{10}$$

individuals capture rents of

$$\begin{aligned} V_A(N_A, N_D, \theta, 1, 1) &= \frac{R((\theta-z)N_a(1+\theta)-(1+z)\theta)}{N_A(\theta+1)^2}, \\ V_D(N_A, N_D, \theta, 1, 1) &= \frac{R((1-\theta z)N_d(1+\theta)-(1+z)\theta)}{N_D(\theta+1)^2}. \end{aligned} \tag{11}$$

While a full comparison of the various Nash equilibria is both a bit tedious and only marginally relevant to our analysis, some aspects deserve mention. Differences in group sizes ($N_A \neq N_D$) and productivities ($\theta \neq 1$) shape the intensity of conflicts in a complex way. Comparing (10) and (5) for groups of equal size ($N_A = N_D$) shows that group identities lead to a higher conflict intensity. Comparing, again for identical group sizes, contest efforts a_i and d_i in the asymmetric cases 2 and 3, individual efforts are higher in groups with a group identity than in individualistic groups. Sharper hostility (a higher level of z) lead to more intense conflicts. Payoff comparisons will be established in Section 4.4.

4.3 Identities in equilibrium

In the first stage of the game, each individual of group A (D) maximizes her utility by the choice of α^i (δ_i), taking into consideration the second subgame, the α^{-i} (δ^{-i}) and the resulting δ (α). The "unanimous" aggregation rules (3) imply that the game has multiple Nash equilibria, all resulting from self-fulfilling expectations about individualistic strategies by at least one other member of the group. In order to get rid of the multiplicity of equilibria (which cannot be avoided in any coordination game) we therefore look for trembling-hand perfect equilibria of the subgame. The basic idea that motivates the use of this concept is that the event that all except for one individuals of a group unanimously choose either an individualistic or a group identity happens with strictly positive probability in any perturbed game. As a consequence, every individual has a strictly positive probability of being decisive for the determination of a group identity.

Let $\Gamma = \{N_A, N_D, \{\alpha_i\}_{i=1,\ldots,N_A}, \{\delta_j\}_{j=1,\ldots,N_D}, \alpha(.), \delta(.), V_A(.), V_D(.)\}$ be the strategic form of the first-stage game. For $i = 1, \ldots, N_A$, denote by α_i^M a mixed strategy for α_i (i.e., a probability that $\alpha_i = 1$ is played) and, likewise, by δ_j^M a mixed strategy on δ_j (with $j = 1, \ldots, N_D$). The corresponding game in mixed strategies is defined by $\Gamma^M = \{N_A, N_D, \{\alpha_i^M\}_{i=1,\ldots,N_A}, \{\delta_j^M\}_{j=1,\ldots,N_D}, \alpha(.), \delta(.), E[V_A(.)], E[V_D(.)]\}$, where we have assumed that individuals maximize their expected material payoff and $E[.]$ denotes the expectations operator. A perturbed game Γ^P is a game Γ^M that allows only for totally mixed strategies $\alpha_i^M \in (0,1)$, $\delta_j^M \in (0,1)$.

Definition: A strategy profile $\{\alpha_i^*\}_{i=1,\ldots,N_A}, \{\delta_j^*\}_{j=1,\ldots,N_D}$ in Γ is a trembling-hand perfect Nash equilibrium if there is a sequence of perturbed games Γ^P, converging to Γ, for which the sequence of Nash equilibria $\{\alpha_i^{M*}\}_{i=1,\ldots,N_A}, \{\delta_j^{M*}\}_{j=1,\ldots,N_D}$ converges to $\{\alpha_i^*\}_{i=1,\ldots,N_A}, \{\delta_j^*\}_{j=1,\ldots,N_D}$.

Via (3), each trembling-hand perfect equilibrium for individual identity choices gives rise to a unique identity profile (α, δ) across groups. For our purposes it suffices to consider these profiles which, with slight abuse in terminology, we shall refer to as the Nash equilibrium identities of the identity-choice game. The following result, which is an immediate corollary of the more technical Proposition 3 on trembling-hand perfect equilibria in the Appendix, summarizes for two scenarios:

> **Proposition 1:** Suppose that the hostility towards others which goes along with a group identity is not too strong ($0 \leq z \leq \hat{z} \ll 1$). Then there exist threshold values $\underline{\theta}(z, N_A, N_D)$ and $\bar{\theta}(z, N_A, N_D)$ with $0 < \underline{\theta}(z, N_A, N_D) < \bar{\theta}(z, N_A, N_D)$ for all (z, N_A, N_D) such that:
>
> 1. if $\theta < \underline{\theta}(z, N_A, N_D)$ the unique Nash equilibrium of the identity-choice game is $(\alpha, \delta) = (0, 1)$;
> 2. if $\underline{\theta}(z, N_A, N_D) < \theta < \bar{\theta}(z, N_A, N_D)$ the unique Nash equilibrium of the identity-choice game is $(\alpha, \delta) = (1, 1)$;
> 3. if $\theta > \bar{\theta}(z, N_A, N_D)$ the unique Nash equilibrium of the identity-choice game is $(\alpha, \delta) = (1, 0)$.
>
> Suppose that the hostility towards others that is associated with a group identity is strong ($1 > z > \hat{z}$). Then there exist threshold values $\underline{\theta}(z, N_A, N_D)$ and $\bar{\theta}(z, N_A, N_D)$ with $0 < \underline{\theta}(z, N_A, N_D) < \bar{\theta}(z, N_A, N_D)$ for all (z, N_A, N_D) such:
>
> 1. if $\theta < \underline{\theta}(z, N_A, N_D)$ the unique Nash equilibrium of the identity-choice game is $(\alpha, \delta) = (0, 1)$;
> 2. if $\underline{\theta}(z, N_A, N_D) < \theta < \bar{\theta}(z, N_A, N_D)$ there exist two Nash equilibria in the identity-choice game: $(\alpha, \delta) = (1, 0)$ and $(\alpha, \delta) = (0, 1)$;
> 3. if $\theta > \bar{\theta}(z, N_A, N_D)$ the unique Nash equilibrium of the identity-choice game is $(\alpha, \delta) = (1, 0)$.

For an explanation let us start with the case of no or weak hostility levels ($0 \leq z < \hat{z}$): if neither group A nor D has a large relative advantage in the contest, it is a dominant strategy for all individuals to identify with their respective group. Hence, identity profile $(\alpha, \delta) = (1, 1)$ emerges in the equilibrium. If one group, however, has a sufficiently large advantage in the contest, the picture changes. Suppose, e.g., that θ is large, i.e., group A has a large relative advantage. Group A then still has a dominant strategy to choose a group identity. With θ sufficiently large, however, it is also a dominant strategy for individuals of group D not to identify with their group. For "intermediate" values of θ, individuals of group D would prefer a group identity if individuals of group A chose an individualistic identity, whereas they would prefer an individualistic identity otherwise.

The intuition for the existence of asymmetric equilibria can best be understood from Dixit's (1987) discussion of underdogs and favorites in contests. Without behavioral changes by group A, group D would unambiguously benefit from choosing a group identity. However, group A reacts to changes in behavior by group D. For large values of θ, efforts a of group A are strategic complements for efforts d of group D, and d is a strategic substitute for a. This implies that group A will react by increasing its investment in the contest when group D adopts a group identity (and thus, ceteris paribus, becomes more aggressive). As θ is large (group A has a more effective contest technology), this reduces the chances for group D to succeed in the contest in spite of the identity-induced increase in d. Hence, group D is better off by not adopting a group identity. Similar effects arise with respect to group sizes: a group identity is beneficial for large and strong groups but may be detrimental for weak and small groups (see below).

Stronger levels of hostility ($z > \hat{z}$) make the adoption of a group identity *ceteris paribus* more attractive for strong groups: the marginal benefit of investments in the contest is now even larger (out of the motive of spite), and having a group identity fosters investments. For a weak group, however, the "underdog"-position becomes even less attractive with stronger hostility, and the incentive to stop the stronger group from exerting too much effort in the contest increases. Hence, hostility reinforces the intuition for asymmetric groups.

The results suggest an important interplay between group identities and contest structure that has so far not been analyzed in the literature. Re-iterating the applications discussed in Section 2, this interdependency of group identities and contest structure sheds some light on processes like the development and breakdown of team- or fighting spirit in sports or warfare or (as a more singular, historical event) the asynchronous development of nationalism. Proposition 1 implicitly also encompasses interesting comparative statics with respect to group sizes (N_A, N_D) and relative contest efficiency (θ). Exogenous shifts in these parameters lead to different identity equilibria. In particular, a decrease in N_A or in θ may induce group A to replace a formerly held group identity by an individualistic identity (*mutatis mutandis*, for group D this might happen when N_D decreases or θ increases) and, consequently, to a discontinuous reduction in contest efforts. This might help to explain the "battlefield phenomena" described in Section 2. Similarly, starting from a situation with a one-sided group identity, the formerly individualistic group (which was relatively small or weak) may adopt switch to a group identity and, as a consequence, to a sharper between-group conflict once it experiences an increase in size or in relative productivity; this is reminiscent of Gellner's Ruritania narrative for nationalism. On a more abstract level, our model points to a theory of dysfunctional individual or group identities (Fang and Loury, 2005) that is based on the observation that apparently dysfunctional identities – in our case the non-adoption of a (costless) group identity with its positive effects on within-group incentives – may in fact be a rational adaptation to a dominant environment.

4.4 Welfare

To analyze the implications of identity choice on individual welfare, we compare the equilibrium levels of material welfare with the levels when both groups choose an individualistic identity.

Proposition 2:

1. For any asymmetric equilibrium where either group A has a group identity and group D not, or group D has a group identity and group A not, the group with a group identity is better off and the individualistic group is worse off compared to a situation of two-sided individualism.
2. For an equilibrium with two-sided group identities, both groups are worse off if they have similar sizes, group A is better off and group D is worse off if N_A is sufficiently larger than N_D and θ is relatively large, group D is better off and group A is worse off if N_D is sufficiently larger than N_A and θ is relatively small, compared to a situation of two-sided individualism.

Proposition 2 shows that the unilateral formation of group identities increases the material welfare of the group with group-identity, but necessarily at the expense of the other, individualistic group. If z is sufficiently small to allow for two-sided group identities, it is even the case that both groups lose from the formation of group identities if they are of similar size. However, even with two-sided group identities it is possible that one group profits at the expense of the other, namely if this group is sufficiently larger than the other or has a sufficiently large technological advantage.

When applied to military conflicts, Proposition 2 highlight the fact that the development of a group identity or ideals like "service before self" may in fact mitigate the incentive problem present for each soldier involved in a battle. However, because the incentives to create those identities are on both sides, the consequence is an intensification of the conflict and, consequently, a larger dissipation of the rent. This is reminiscent of Dawes (1980)'s analysis of battles as a social dilemma where, without group identity, "taking chances" (i.e., defection) is rational for the individual but harmful to the group while, from a broader perspective that includes all soldiers on both sides, defection is both individually rational and collectively efficient. If individual incentives for defection are eliminated (by, say, promoting group identities), "*the result will be a rout and slaughter worse for all the soldiers than is taking chances*" (Dawes, 1980, p. 170).

In all cases where one group has a sufficiently superior conflict technology (as measured by θ) this group can and will profit at the expense of the other group by the creation of an identity that helps solving incentive problems.

5 Conclusions

Social identities are neither exogenously given nor chosen by individuals in hermitage or adopted by groups in isolation. They are equilibrium outcomes and can only be understood relative to the social game in which they are embedded. This general point and the specific results derived in this paper have positive as well as normative implications for the evaluation of strategies with the aim of promoting identification of members with the objectives of the group. From a normative point of view, contrary to the optimistic picture portrayed by most of the current partial-equilibrium literature on identities, our general-equilibrium analysis shows that there might be a dark side: If the incentive problem to be solved by means of identification strategies has the character of a contest, both groups may turn out to be worse off, and the resulting equilibrium has the character of a prisoners' dilemma. From a positive point of view, our results identify two key variables that influence group identities in conflicts: differences in relative strength between the groups and relative group sizes. By and large, a group identity seems to be more important in large groups with a relatively effective conflict technology.

As Section 2 illustrates, the general effects emerging from our model may help to explain social phenomena in a variety of societal conflicts and contests. It is needless to say, however, that conflicts are not solely identity-driven and that identities may evolve also in situations, or from aspects, other than contests. Yet, the analysis of identities as an equilibrium outcome and of the determinants that shape them appears a promising research avenue for which economic methodology appears to be particularly well-equipped.

Appendix

Proof of Proposition 1:

Proposition 1 is an immediate corollary of

Proposition 3: There exists threshold values $\hat{z} \in (0,1)$, $\underline{\theta}(z, N_A, N_D)$ and $\bar{\theta}(z, N_A, N_D)$ with $0 < \underline{\theta}(z, N_A, N_D) < \bar{\theta}(z, N_A, N_D)$ such that the following holds.

If $z \leq \hat{z}$ and

1. if $\theta < \underline{\theta}(z, N_A, N_D)$ the unique trembling-hand perfect Nash equilibrium is $\alpha_i^* = 0$, $\delta_j^* = 1$, $i = 1, \ldots, N_A$, $j = 1, \ldots, N_D$,
2. if $\underline{\theta}(z, N_A, N_D) < \theta < \bar{\theta}(z, N_A, N_D)$ the unique trembling-hand perfect Nash equilibrium is $\alpha_i^* = 1$, $\delta_j^* = 1$, $i = 1, \ldots, N_A$, $j = 1, \ldots, N_D$,
3. if $\theta > \bar{\theta}(z, N_A, N_D)$ the unique trembling-hand perfect Nash equilibrium is $\alpha_i^* = 1$, $\delta_j^* = 0$, $i = 1, \ldots, N_A$, $j = 1, \ldots, N_D$,
4. if $\theta = \underline{\theta}(z, N_A, N_D)$ or $\theta = \bar{\theta}(z, N_A, N_D)$ there exist two trembling-hand perfect Nash equilibria, $\alpha_i^* = 0$, $\delta_j^* = 1$ and $\alpha_i^* = 1$, $\delta_j^* = 1$, and $\alpha_i^* = 1$, $\delta_j^* = 0$ and $\alpha_i^* = 1$, $\delta_j^* = 1$, respectively.

If $z > \hat{z}$ and

1. if $\theta < \underline{\theta}(z, N_A, N_D)$ the unique trembling-hand perfect Nash equilibrium is $\alpha_i^* = 0$, $\delta_j^* = 1$, $i = 1, \ldots, N_A$, $j = 1, \ldots, N_D$,
2. if $\underline{\theta}(z, N_A, N_D) \leq \theta \leq \bar{\theta}(z, N_A, N_D)$ there exist two trembling-hand perfect Nash equilibria, $\alpha_i^* = 0$, $\delta_j^* = 1$, and $\alpha_i^* = 1$, $\delta_j^* = 0$, $i = 1, \ldots, N_A, j = 1, \ldots, N_D$,
3. if $\theta > \bar{\theta}(z, N_A, N_D)$ the unique trembling-hand perfect Nash equilibrium is $\alpha_i^* = 1$, $\delta_j^* = 0$, $i = 1, \ldots, N_A, j = 1, \ldots, N_D$.

If $z = \hat{z}$ and

1. if $\theta < \underline{\theta}(z, N_A, N_D)$ the unique trembling-hand perfect Nash equilibrium is $\alpha_i^* = 0$, $\delta_j^* = 1$, $i = 1, \ldots, N_A, j = 1, \ldots, N_D$,
2. if $\underline{\theta}(z, N_A, N_D) \leq \theta \leq \bar{\theta}(z, N_A, N_D)$ there exist three trembling-hand perfect Nash equilibria, $\alpha_i^* = 0$, $\delta_j^* = 1$, $\alpha_i^* = 1$, $\delta_j^* = 0$, and $\alpha_i^* = 1$, $\delta_j^* = 1$, $i = 1, \ldots, N_A, j = 1, \ldots, N_D$,
3. if $\theta > \bar{\theta}(z, N_A, N_D)$ the unique trembling-hand perfect Nash equilibrium is $\alpha_i^* = 1$, $\delta_j^* = 0$, $i = 1, \ldots, N_A$, $j = 1, \ldots, N_D$.

Proof of Proposition 3:

The payoff structure for given identities $\{\alpha, \delta\}$ is given in the following matrix, where group A's identity is displayed in the rows and group D's identity in the columns.

	$\delta = 1$	$\delta = 0$
$\alpha = 1$	$V_A(N_A, N_D, \theta, 1, 1), V_D(N_A, N_D, \theta, 1, 1)$	$V_A(N_A, N_D, \theta, 1, 0), V_D(N_A, N_D, \theta, 1, 0)$
$\alpha = 0$	$V_A(N_A, N_D, \theta, 0, 1), V_D(N_A, N_D, \theta, 0, 1)$	$V_A(N_A, N_D, \theta, 0, 0), V_D(N_A, N_D, \theta, 0, 0)$

Group D: (i.) Assume that individuals of group A independently play $\alpha_i = 0$ with probability $1 - \epsilon_A, \epsilon_A > 0$. In that case, members of the group have an individualistic identity with probability $1 - \epsilon_A^{N_A}$. Assume in addition that individuals of group D independently play $\delta_j = 0$ with probability $1 - \epsilon_D, \epsilon_D > 0$. For $\epsilon_A \to 0$, the utility differential that results from the creation of a group identity for a member of group D is

$$\begin{aligned}\Delta_D(\alpha = 0) &= V_D(N_A, N_D, \theta, 0, 1) - V_D(N_A, N_D, \theta, 0, 0) \\ &= \left(\frac{(z+1)(zN_A + N_A - \theta z)}{(zN_A + N_A + \theta)^2} - \frac{N_A + (N_D - 1)\theta}{(N_A + N_D\theta)^2} \right) \frac{N_A R}{N_D}.\end{aligned}$$

This is non-negative if and only if

$$\theta \le \theta_D^1 := \frac{N_A(N_D + (N_D - 2)z - 1) + \sqrt{N_A^2 \left(N_D^2(z+1)^2 - 2N_D(z+1) + 4z(z+2) + 5\right)}}{2N_D z + 2} > 0.$$

Individual k of group D is only decisive in influencing the group identity of all other members of group D vote $\delta_j = 1$, with happens with probability $\epsilon_D^{N_D - 1} > 0 \forall \epsilon_D > 0$. Hence, an individual of group D is better off adopting a group identity.

(ii.) Assume that individuals of group A independently play $\alpha_i = 1$ with probability $1 - \epsilon_A, \epsilon_A > 0$. In that case, members of the group have a group identity with probability $1 - \epsilon_A^{N_A}$. Assume in addition that individuals of group D independently play $\delta_j = 0$ with probability $1 - \epsilon_D, \epsilon_D > 0$. For $\epsilon_A \to 0$, the utility differential that results from the creation of a group identity for a member of group D is

$$\begin{aligned}\Delta_D(\alpha = 1) &= V_D(N_A, N_D, \theta, 1, 1) - V_D(N_A, N_D, \theta, 1, 0) \\ &= \left(\frac{1 - \theta z}{(\theta + 1)^2} - \frac{(N_D - 1)\theta(z+1) + 1}{(N_D\theta(z+1) + 1)^2} \right) \frac{R}{N_D}.\end{aligned}$$

This is non-negative if and only if

$$\theta \le \theta_D^2 := \frac{2}{2z - N_D(z+1) + \sqrt{N_D^2(z+1)^2 - 2N_D(z+1) + 4z(z+2) + 5} + 1} > 0.$$

Individual k of group D is only decisive in influencing the group identity if all other members of group D choose $\delta_j = 1$, with happens with probability $\epsilon_D^{N_D - 1} > 0 \forall \epsilon_D > 0$. Hence, an individual of group D is better off adopting a group identity.

Group A: (iii.) Assume that individuals of group D independently play $\delta_j = 0$ with probability $1 - \epsilon_D, \epsilon_D > 0$. In that case, members of the group have an individualistic identity with probability $1 - \epsilon_D^{N_D}$. Assume in addition that individuals of group A independently play $\alpha_i = 0$ with probability $1 - \epsilon_A, \epsilon_A > 0$. For $\epsilon_D \to 0$, the utility differential that results from the creation of a group identity for a member of group A is

$$\begin{aligned}\Delta_A(\delta=0) &= V_A(N_A,N_D,\theta,1,0)-V_A(N_A,N_D,\theta,0,0)\\ &= \left(\frac{(z+1)(N_D\theta(z+1)-z)}{(N_D\theta(z+1)+1)^2}-\frac{N_A+N_D\theta-1}{(N_A+N_D\theta)^2}\right)\frac{N_D\theta R}{N_A}\theta,\end{aligned}$$

which is non-negative if and only if

$$\theta \geq \theta_A^1 := \frac{\sqrt{N_D^2\left(N_A^2(z+1)^2-2N_A(z+1)+4z(z+2)+5\right)}-N_D(N_A+(N_A-2)z-1)}{2N_D^2(z+1)} > 0.$$

Individual k of group A is only decisive in influencing the group identity of all other members of group A vote $\alpha_i=1$, with happens with probability $\epsilon_A^{N_A-1}>0\forall\epsilon_A>0$. Hence, an individual of group D is better off adopting a group identity.

(iv.) Assume that individuals of group D independently play $\delta_j=1$ with probability $1-\epsilon_D, \epsilon_D>0$. In that case, members of the group have a group identity with probability $1-\epsilon_D^{N_D}$. Assume in addition that individuals of group A independently play $\alpha_i=0$ with probability $1-\epsilon_A, \epsilon_A>0$. For $\epsilon_D\to 0$, the utility differential that results from the creation of a group identity for a member of group A is

$$\begin{aligned}\Delta_A(\delta=1) &= V_A(N_A,N_D,\theta,1,1)-V_A(N_A,N_D,\theta,0,1)\\ &= \left(\frac{\theta-z}{(\theta+1)^2}-\frac{N_A+\theta+(N_A-1)z-1}{(zN_A+N_A+\theta)^2}\right)\frac{\theta R}{N_A},\end{aligned}$$

which is non-negative if and only if

$$\theta \leq \theta_A^2 := \frac{1}{2}\left(2z-N_A(z+1)+\sqrt{N_A^2(z+1)^2-2N_A(z+1)+4z(z+2)+5}+1\right) > 0.$$

Individual k of group A is only decisive in influencing the group identity of all other members of group A vote $\alpha_i=1$, with happens with probability $\epsilon_A^{N_A-1}>0\forall\epsilon_A>0$. Hence, an individual of group A is better off adopting a group identity.

(v.) Next, it is straightforward to show that $\theta_A^1<\theta_A^2$ and $\theta_D^2<\theta_D^1$. Depending on z, we get the following inequalities:

- If $z<\hat{z}$, it follows that $\theta_A^1<\theta_A^2<\theta_D^2<\theta_D^1$.
- If $z>\hat{z}$, it follows that $\theta_A^1<\theta_D^2<\theta_A^2<\theta_D^1$.
- If $z=\hat{z}$, it follows that $\theta_A^1<\theta_D^2=\theta_A^2<\theta_D^1$.

$\hat{z}$ is implicitly defined by $\Psi(\hat{z}):=\theta_D^2(\hat{z})-\theta_A^2(\hat{z})=0$.

Let $z<\hat{z}$. It follows that $\alpha_i=0,\delta_j=1, i=1,\ldots,N_A, j=1,\ldots,N_D$ is the trembling-hand perfect equilibrium for $\theta\in[0,\theta_A^2)$. For $\theta\in(\theta_A^2,\theta_D^2)$ it follows that $\alpha_i=1,\delta_j=1$ is the trembling-hand perfect equilibrium. For $\theta\in(\theta_D^2,\infty)$ it follows that $\alpha_i=1,\delta_j=0$, $i=1,\ldots,N_A, j=1,\ldots,N_D$ is the trembling-hand perfect equilibrium. Finally, for the boundary cases $\theta=\theta_A^2$ and $\theta=\theta_D^2$ it is straightforward that the equilibria from both connecting intervals remain equilibria. Putting $\underline{\theta}=\theta_D^2$ and $\bar{\theta}=\theta_A^2$, the claim follows.

Let $z > \hat{z}$. With the above utility differentials it follows that $\alpha_i = 0, \delta_j = 1, i = 1, \ldots, N_A, j = 1, \ldots, N_D$ is the trembling-hand perfect equilibrium for $\theta \in [0, \theta_D^2)$. For $\theta \in [\theta_D^2, \theta_A^2]$ it follows that $\alpha_i = 0, \delta_j = 1$ as well as $\alpha_i = 1, \delta_j = 0$, $i = 1, \ldots, N_A, j = 1, \ldots, N_D$ are trembling-hand perfect equilibria. Finally, for $\theta \in (\theta_A^2, \infty)$ it follows that $\alpha_i = 1, \delta_j = 0$, $i = 1, \ldots, N_A, j = 1, \ldots, N_D$ is the trembling-hand perfect equilibrium. Putting $\underline{\theta} = \theta_A^2$ and $\bar{\theta} = \theta_D^2$, the claim follows.

If $z = \hat{z}$ one gets $\theta_A^2 = \theta_D^2$. In this case, $\alpha_i = 0, \delta_j = 1, i = 1, \ldots, N_A, j = 1, \ldots, N_D$ is the trembling-hand perfect equilibrium for $\theta \in [0, \theta_D^2)$, $\alpha_i = 0, \delta_j = 1$ is the trembling-hand perfect equilibrium for $\theta \in (\theta_D^2, \infty$, and there are three trembling-hand perfect equilibria at $\theta = \theta_D^2$, $\alpha_i = 0, \delta_j = 1$; $\alpha_i = 1, \delta_j = 0$; and $\alpha_i = 1, \delta_j = 1$. Putting $\underline{\theta} = \bar{\theta} = \theta_A^2 = \theta_D^2$, the claim follows. *q.e.d.*

Proof of Proposition 2:

Consider asymmetric equilibria first. Assume there exists an equilibrium with $\alpha = 0, \delta = 1$. In this equilibrium, individuals of group D must be better off by revealed preferences. Individuals of group A are not worse off if and only if $V_A(\ldots, 0, 1) \geq V_A(\ldots, 0, 0)$, which is equivalent to

$$\begin{aligned} & \frac{N_A + \theta + (N_A - 1)z - 1}{(zN_A + N_A + \theta)^2} - \frac{N_D(N_A + N_D\theta - 1)}{(N_A + N_D\theta)^2} \geq 0 \\ \Leftrightarrow \quad & -N_A(zN_A + N_A - 1)\left((\theta + 1)(z + 1)N_A^2 + \left(\theta^2 + \theta - z - 1\right) N_A + \theta^2\right) \geq 0 \\ \Leftrightarrow \quad & (N_A - 1)(z + 1) + \theta((1 + z)N_A + (1 + \theta)) \leq 0, \end{aligned} \tag{A.1}$$

which, however, contradicts the assumption that $N_A, N_D \geq 2$.

Next assume there exists an equilibrium with $\alpha = 1, \delta = 0$. In this equilibrium, individuals of group A must be better off by revealed preferences. Individuals of group D are not worse off if and only if $V_D(\ldots, 1, 0) \geq V_D(\ldots, 0, 0)$, which is equivalent to

$$\begin{aligned} & \frac{N_A + \theta + (N_A - 1)z - 1}{(zN_A + N_A + \theta)^2} - \frac{N_D(N_A + N_D\Theta - 1)}{(N_A + N_D\theta)^2} \geq 0 \\ \Leftrightarrow \quad & -\theta(zN_A + N_A - 1)\left(\theta((N_D - 1)\theta(z + 1) + 1)N_D^2 + N_A\left(\theta(z + 1)N_A^2 + N_D + 1\right)\right) \geq 0, \end{aligned} \tag{A.2}$$

which again contradicts the assumption that $N_A \geq 2$.

In a symmetric equilibrium $\alpha = 1, \delta = 1$, group A or D is better off if and only if (i) $V_A(\ldots, 1, 1) \geq V_A(\ldots, 0, 0)$ and (ii) $V_D(\ldots, 1, 1) \geq V_D(\ldots, 0, 0)$, which is equivalent to

$$\begin{aligned} A: \quad & \frac{\theta - z}{(\theta + 1)^2} - \frac{N_D(N_A + N_D\theta - 1)}{(N_A + N_D\theta)^2} \geq 0, \\ D: \quad & \frac{1 - \theta z}{(\theta + 1)^2} - \frac{N_A(N_A + (N_D - 1)\theta)}{(N_A + N_D\theta)^2} \geq 0. \end{aligned} \tag{A.3}$$

If $N_A = N_D = N$, these conditions simplify to

$$\begin{aligned} A: \quad & \frac{1 - N(z + 1)}{N(\theta + 1)^2} \geq 0, \\ D: \quad & -\frac{\theta(zN + N - 1)}{N(\theta + 1)^2} \geq 0, \end{aligned}$$

which immediately contradicts the conjecture. For general population structures, (A.3) has been analyzed using the software package Mathematica 7. The function $Reduce[X >= 0\&\&Na >= 2\&\&Nd >= 2\&\&0 >= z >= 1\&\&t >= 0]$, where X stands for either the left-hand side of the inequality for the A or D-group in (A.3), has generated $false$ as output both times. *q.e.d.*

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