Essays on the Economics of Conflict

Ranajoy Guha Neogi

A dissertation submitted to the Indian Statistical Institute in partial fulfilment of the requirements for the award of the degree of

Doctor of Philosophy (Quantitative Economics)

at the

Economic Research Unit

Indian Statistical Institute

Kolkata - 700108

May 2021

Essays on the Economics of Conflict

by

Ranajoy Guha Neogi

Supervisor: Prof. Indraneel Dasgupta

May 2021

Acknowledgement

The journey of a doctoral student is of a unique kind. It is arduous but fulfilling at certain points. When I embarked upon my doctoral research as a research scholar - it was like moving into a vast unknown territory.

In my case I am blessed to have Prof. Indraneel Dasgupta as my supervisor who took me through this journey. His eternal patience with my varied shortcomings and his guidance, unwavering support and reassurances during this journey is a bliss that I shall cherish throughout my life. The thesis would not have taken its current shape without him.

I am indebted to the faculty of Economics at Indian Statistical Institute, Kolkata for their support and encouragement.

I am thankful to all the fellow research scholars, especially my batchmates, at the Economic Research Unit, Indian Statistical Institute, Kolkata whom I have met and interacted with for brainstorming and active discussions on both the academic and non-academic fronts at different points of time. They have been integral to this journey. I am thankful to Indian Statistical Institute for providing fellowship during my time as a full-time scholar.

At my current job at Reserve Bank of India, I am grateful to my seniors and colleagues for active encouragement in research.

Last but not the least, I would like to thank each of my family members for their well wishes and support.

May, 2021 Ranajoy Guha Neogi

Contents

Chapter I

Introduction

The thesis encompasses three chapters which provide policy-relevant insights into the domain of conflict economics. The research endeavour goes deep into exploring the underlying linkages of varied economic and non-economic factors (e.g., culture, religion and myriads of ethnic factors) leading to the multiple facets of economic outcomes. The analyses in the thesis, which fall in the realm of applied microeconomic theory, are facilitated by different tools of game theory and public economics. Although the focuses of these chapters lie in the domain of economics of conflict (and its policy implications under different situations), each chapter addresses the conflicts engendered in different scenarios such as conflict emanating from imposed language policy, underlying ethnic fragmentations within communities and the consequent productive and rent-seeking activities and the policy implications of promulgating individual rights in the presence of religiosity (or the lack of it) in the society. The rent seeking activities (in terms of exerted effort or in pecuniary terms) in our models endogenously emerge out of rational decisions of the agents at their end in the contexts under consideration. The delineation of the linkages between different economic and non-economic factors through the frameworks of the interacting agents, leads us to divulge the fabrics behind the observed instances of wasteful conflict in so many forms and to comprehend the driving forces behind the economic outcomes. This analysis also helps us to realize the logic behind the apparently counter-intuitive occurrences and consequent policy challenges.

In Chapter 2 the ethno-linguistic policy itself is the site of contestation, in Chapter 3 the role of fragmentation within the conflicting groups is the fundamental determinant under focus and in Chapter 4 the individual liberty (or lack of it, due to the decreed norms) is the point of study to unravel the economic and policy implications.

Chapter 2 analyses the policy implications surrounding a possible blanket imposition of alien ethno-linguistic norms through coercive language policy and the contingent conflict due to the consequent redistribution of the resources within the community. The extant property rights emerge as a crucial determinant of the economic outcomes in this scenario. *Chapter 3* formalizes the mesmerising role of the extent of within-group fragmentations in determining the productive and rent-seeking activities in the presence of a conflictual public good between the groups. We show that in this framework fragmentation can be beneficial in certain contexts. Here, we show that in this context public good provisioning cannot be straight away taken as an indicator of the well-being. *Chapter 4* deals with the role of the laws of liberty and individual rights in a sufficiently secularized society. We show how the laws on liberty can accentuate or mitigate conflict between the religious and secular groups, and how these outcomes put the policy maker in front of complex policy dilemmas.

1.1. Decolonization, Property Rights and Language Conflicts

We model political contestation over school language policy, within linguistic communities where weak property rights protection leads to high decentralized expropriation. We show that improvements in governance institutions that facilitate property rights protection might exacerbate such language conflicts, even as they reduce the chances of persisting with educational indigenization, while, paradoxically, increasing the net social benefit from doing so. Our findings offer explanations of why languages and cultures of the colonizers continue to play a dominant role in the educational systems of most post-colonial developing societies, and why early post-independence attempts at cultural-linguistic indigenization were either reversed or slowed down subsequently. The main policy implication of our analysis relates to the connection it establishes between property rights protection and the welfare consequences of educational indigenization: such indigenization may improve social welfare when weak institutions lead to weak property-rights protection, but reduce it otherwise.

1.2. Between-group contests over group-specific public goods with within-group fragmentation

We model a contest between two groups of equal sized populations over the division of a group-specific public good. Each group is fragmented into subgroups. Each subgroup allocates effort between production and contestation. Perfect coordination is assumed within subgroups, but subgroups cannot coordinate with one another. All subgroups choose effort allocations simultaneously. We find that the group that is more internally fragmented receives the smaller share of the public good. Aggregate rent-seeking increases when the dominant subgroups within both communities have larger population shares. Any unilateral increase in fragmentation within a group reduces conflict and increases the total income of its opponent. Strikingly, the fragmenting community itself may, however, increase its total income as well, even though its share of the public good declines. Hence, a smaller share of public good provisioning cannot be used to infer a negative income effect on the losing community.

1.3. Liberty and Conflict

We model a contest over public sphere dominance between the groups of religious and secular individuals. In a work environment, the stronger liberty norms (or lack of it) directly reduce the scale of disutility of the efforts of the secular (religious) individuals. The aggregate rent seeking effort, to dominate public sphere, attains its maximum under perfectly reconciliatory norms between the two groups. Thus, an ideal, unprejudiced workplace norm ends up engendering highest amount of conflict. It is observed that productive efforts and conflict efforts might not always have opposite dynamics and under a very antagonistic workplace norm, further worsening of the norms can bring down all kinds of efforts for an individual. Inequality is also surprisingly found to change monotonically with respect to changing workplace norms. Aggregate productive effort, under sufficiently large groups of secular and religious individuals, reaches minimum when the norms are to some extent biased towards the minority group. The maximum aggregate social output is only attained by aligning the regulations to the maximum extent possible to the norms of the majority group.

Chapter II

Decolonization, Property Rights and Language Conflicts[1]

2.1. Introduction

European colonial administrations in the 19th and early 20th centuries developed educational systems in their colonies which typically deployed the colonizer's language as the medium of instruction (especially beyond the primary level), followed syllabi almost entirely derived from those operative in the colonial metropole, and adopted the colonizer's cultural practices (e.g. dress codes and sports rituals). Immediately after attaining independence in the years following World War II, many developing countries adopted indigenization of the educational system as an immediate policy objective. Changing the medium of instruction to a local language was the most important component of the indigenization package proposed. But large-scale changes in the syllabus to incorporate local histories, concerns and knowledge traditions, and cultural indigenization of the pedagogic process, were both deemed important as well. The basic instrumental justification offered for such indigenization was its putative contribution to the spread of education among the masses, as opposed to the small elites among whom education had been concentrated under colonialism. In practice, however, indigenization of was often implemented only quite partially, especially beyond the primary level. Furthermore, in the decades following independence, there was a significant roll-back of indigenization

[1] The chapter is co-authored with Prof. Indraneel Dasgupta.

efforts in many countries, even as the issue maintained its political salience and domestic political divisions persisted over the questions of the medium of instruction, course content and cultural practices to be adopted within the national educational system.[2] Why did this happen? How was the process affected by the development and strengthening of governance institutions within developing countries that improved the extent of property rights protection? What were the consequences for social welfare? This paper offers a simple theoretical framework that sheds suggestive analytical light on these questions.

It is evident that adopting a global language introduced by European colonial rule (such as English or French) and its associated cultural, behavioural and expressive conventions has the potential to generate social benefits, by facilitating economic interaction with the external world beyond the confines of the immediate language community, thereby expanding the size of the market and permitting the achievement of productivity gains through specialization and economies of scale.[3] The smaller the immediate language community, the larger these productivity gains relative to a status quo involving linguistic autarchy. At the same time, such language shift imposes adjustment costs, both psychic and material, on the adjusting community, which can be significant for at least some sections. To the extent that individual differences exist in the ability to adapt to and function within alien ethno-linguistic norms and associated behavioural patterns, linguistic-communicative globalization is likely to increase earnings/welfare differentiation within the globalizing community, generating both winners and losers. Furthermore, some sub-groups may have had early and long-standing historical exposure to global languages and cultural conventions under colonialism; the collective social

---

[2] For detailed discussions and country case studies, see Kamwangamalu (2016), Wright (2016, chap. 4), and Lin and Martin (2005).

[3] That individual benefits of acquiring a language is larger, the larger the pre-existing pool of users of that language, is highlighted by Selten and Pool (1991), Church and King (1993) and Lazear (1999).

capital thereby acquired may make it easier for individuals from these (typically elite) sub-groups to adapt and prosper under linguistic globalization.[4] When compensation is imperfect due to information constraints and inability to pre-commit to binding contracts, language policy is therefore likely to generate both winners and losers. Since there are society-wide spill-over effects of individual language choice, language policy thus comes to constitute a site for social conflict between these two groups. The nature of individual gains and losses from adoption of a global language is however also likely to depend crucially on an individual's ability to claim the consequences of her productive effort, i.e., on the strength of property rights protection, broadly interpreted, that she enjoys. Thus, changes in the strength of property rights protection may intuitively be expected to affect language conflict by altering individual incentives, in ways that remain to be formally clarified. Weak institutions typically lead to weak property rights protection and high levels of decentralized expropriation and rent-seeking in post-colonial developing societies. How would an improvement in institutional quality that improves property rights protection affect language politics and, thereby, language policy in these societies?

Despite the emergence of a formal literature on the economics of language in recent years[5], the analytical literature in political economics on language policy as a site of political contestation remains thin. Ortega and Tangerås (2008) develop a political-economic analysis of the imposition of mono-lingual education by dominant groups. Dasgupta (2017) examines how language policy may impact conflict between different ethnic groups along religious or racial dimensions. The problem that we highlight, namely conflict over education policy within

[4] Upper caste Hindu Bengalis in India and Bangladesh, Maronite Christians in Lebanon and Coptic Christians in Egypt constitute standard examples.

[5] See Ginsburgh and Weber (2016) for an overview.

the *same* language group, does not figure in either of these contributions. Our paper seeks to address this gap in the literature. To the best of our knowledge, the contribution closest in intuitive family resemblance to our analysis is by Austen-Smith and Fryer (2005), who model conflicts within the African-American community over 'acting White'. However, the specific institutional focus of their investigation, and their modelling strategy, are both very different from those adopted in this paper. In particular, consequences of changes in property rights protection, which form the core of our analysis, do not figure in their analysis at all.

We model a society consisting of a single linguistic community, where conflict arises over attempts by a section of the community to impose a different, global, language on the entire community, from a status quo of linguistic indigenization, where individuals use (only) their own language. We model a two-stage process where, in the first stage, the state's language policy comes about as the probabilistic consequence of a process of Tullock (1980) contestation between the two groups. We interpret this in terms of a proposal to change the medium of instruction in the entire educational system in the society from the community's own language to some other, global, language, along with the imposition of the associated (alien) cultural, behavioural and expressive conventions on the population via that system.[6] In the second stage, all individuals take the language policy and the degree of property rights protection (the proportion of one's output that a producer can retain) as given, and decide whether to produce or expropriate. The proportion of the population engaged in production is thus endogenous in our model. Individuals have identical productivity in the linguistic status

[6] This can involve matters such as dress codes (Western clothing rather than traditional ethnic wear), desegregation of genders, inculcation of different norms of health, hygiene and dietary appropriateness, greater exposure to Western cultural traditions and a corresponding reduction of emphasis on indigenous elements, etc. The overhaul and Westernization of the Turkish educational system under Mustafa Kemal Atatürk and that of the Iranian educational system under Reza Shah Pahlavi constitute examples.

quo, which increases with the size of the population, interpreted as a proxy for the size of the market limited by a shared language. However, their productivities vary according to an exponential distribution under linguistic globalization, which exhibits society-wide increasing returns from adoption of the global language. This formulation incorporates two intuitive ideas. First, even as the adoption of a global language and common cultural conventions opens up new productive opportunities by expanding the size of the market, individuals vary in terms of their ability to take advantage of such opportunities.[7] Second, a more widespread adoption of alien linguistic-cultural conventions has a positive productivity spill-over on the entire society by facilitating productive functioning for all. The second feature makes it individually rational for every individual not to attempt a unilateral acquisition of the global language in the status quo, so that language acquisition becomes a matter of collective political action. Under our assumption of a relatively large community, linguistic globalization increases the productivity of a section of the population while simultaneously reducing that of the remainder. We show that, when the linguistic community is relatively large, or property rights protection weak, linguistic globalization reduces aggregate social output, compared to the status quo situation of linguistic indigenization (or autarchy). The proportion of the population engaged in production falls as well. However, the earnings of a section of the population increase. Consequently, in the first period, the winning and losing groups engage in Tullock (1980)

[7] This involves an intuitive elaboration of the idea of idiosyncratic language learning costs deployed by Gabszewicz *et al.* (2011) to include idiosyncratic differences in the ability to function efficiently in an alien linguistic-cultural environment. Armstrong (2015) and Dasgupta (2017) also build in this idea in their models of language learning. For a recent review of empirical evidence on the positive impact of a common language on international trade, see Egger and Toubal (2016).

contestation over language policy, i.e. the probability of linguistic globalization, so as to maximize their respective expected group incomes in the second period.

We find that stronger property rights protection makes linguistic globalization more likely. However, marginal improvements in property rights protection from a low initial level increase the aggregate social loss from such a policy choice, relative to the autarchic status quo. Thus, marginal improvements in property rights protection from a low initial level have the perverse consequence of increasing both the chances of the society adopting an inefficient language policy, viz. linguistic globalization, and the net social cost of doing so. Such improvements also increase conflict over language policy. Beyond a threshold, the larger the linguistic community, the lower the probability of linguistic globalization, but the greater the social waste due to linguistic conflict.

Our findings explain why languages and cultures of the colonizers continue to play a large, often pre-eminent, role in the educational systems of most post-colonial developing societies, and why early post-independence attempts at cultural-linguistic indigenization of these systems were typically either reversed or slowed down subsequently. They also explain the continuing salience of cultural-linguistic indigenization as an item of political contestation in developing societies, by highlighting its redistributive role. Furthermore, they highlight the contradictory impact of cultural-linguistic indigenization of the education system on aggregate social welfare: such indigenization may increase the latter when weak institutions lead to weak property rights protection, but reduce it otherwise. They also draw attention to the contradictory consequences of improvements in institutional quality that strengthen property rights. Such improvements may initially have the perverse effect of increasing both the chances of inefficient language policy choice and the social cost of such inefficient policy choice; in addition to entailing greater social conflict over language policy.

Section 2.2 sets up the model and discusses our key results. Section 2.3 concludes.

2.2. The model

Consider a society consisting of a linguistic community N, with population size $n \geq 1$. Each member of N acquires that community's language costlessly, through childhood socialization. In the status quo, all members of N are capable of only the language acquired at birth. We call the status quo linguistic autarchy. The government can impose either a global language, M, on the society, via the school system as the medium of instruction, or permit the indefinite perpetuation of linguistic autarchy. We term the former policy option linguistic globalization, or globalization for convenience. Globalization implies that all economic (productive) interaction must be carried out solely via the global language, M.

In the first period, the language policy of the government is determined as the outcome of a process of political contestation. Subsequently, individuals take the language policy as given and act atomistically to maximize their individual incomes.

2.2.1. Language, production and expropriation

We first model the outcomes in the second period. Each individual is endowed with one unit of labour which she can use either for production or expropriation. Producers can retain some proportion of their output, $\gamma \in (0,1)$, reflecting the strength of property rights protection in the society, while the remaining portion is expropriated by non-producers. Property rights parameter (γ) elicits a unique role, since it influences the decision to either produce or expropriate, in a society where property rights are not fully protected and there is scope for expropriation (as often observed especially in developing economies). The extant property rights in a society presumably affects the economic outcomes and thus it is categorically factored into our model. Each individual has to decide whether to produce or engage in expropriation; entry into either sector is costless. Individuals can only engage in economic interaction with other individuals who share a common language. Thus, under linguistic autarchy, members of N can only engage in economic interaction with members of their own linguistic community. The marginal product of an individual is then simply kn, where $k > 0$ is an economy-wide productivity parameter. This captures the idea that the benefit of acquiring a language increases with the number of its speakers (Selten and Pool (1991) and Church and King (1993)), say due to the consequent increase in the market size generating productivity gains through greater scope for specialization and division of labour. Total output under autarchy is therefore given by:

$$Y_T = kn^2\theta_T; \tag{1}$$

where $\theta_T \in (0,1)$ is the proportion of the population engaged in production. Since, in equilibrium, returns must be identical across activities, the equilibrium proportion of the population engaged in production under linguistic autarchy is given by:

$$\frac{(1-\gamma)kn^2\theta_T}{n(1-\theta_T)} = kn\gamma,$$

so that:

$$\theta_T = \gamma. \tag{2}$$

Thus, under autarchy, equilibrium output is given by:

$$Y_T = kn^2\gamma, \tag{3}$$

with individual income:

$$y_T = kn\gamma. \tag{4}$$

Under linguistic globalization, conditional on θ_G proportion of the society producing, individuals can be ranked, in decreasing order of productivity, according to a (conditional) individual productivity function $\mathcal{R}_{\theta_G}(z_G) = [k\alpha {z_G}^{\alpha-1}]\theta_G$, with $\alpha \in (0,1)$ and $z_G \in [0,1]$[8]. Thus, conditional on θ_G proportion of the society being economically active when the state imposes the global language M as a precondition for production, z_G proportion of the society will have individual productivity not less than $[k\alpha {z_G}^{\alpha-1}]\theta_G$, while the remaining proportion $(1 - z_G)$ will consist of individuals with productivity less than $[k\alpha {z_G}^{\alpha-1}]\theta_G$. If θ_G proportion of the society produces, then individual rationality requires that this be the most productive θ_G proportion. Hence the productivity of the marginal (i.e., the lowest productivity) individual *within* the producing class is given by $\mathcal{R}_{\theta_G}(\theta_G) = [k\alpha {\theta_G}^{\alpha-1}]\theta_G$. Total output of the community is therefore:

$$Y_G = k\alpha n\theta_G \int_0^{\theta_G} [{z_G}^{\alpha-1}] dz_G = kn{\theta_G}^{\alpha+1}. \tag{5}$$

Equation (5) implies that, given the level of economic participation $\theta_G < 1$, a rise in α depresses total output. Since $\frac{\partial[\alpha {z_G}^{\alpha-1}]}{\partial\alpha} = \alpha {z_G}^{\alpha-1}[\frac{1}{\alpha} + \ln z_G]$, this implies that higher α depresses the productivity of high productivity individuals (the top $\frac{1}{e^{\frac{1}{\alpha}}}$ proportion of the income distribution), but increases that of low productivity individuals. Thus, higher α implies a reduced *dispersion* of individual productivity under globalization, and hence lower inequality

---

[8] Under linguistic globalization, the native ethnolinguistic network breaks down. The exclusive alien norms get strictly imposed and thus it replaces the native identity-based linguistic network. Thus, unlike autarchy, where the population size is the uniform scaling factor for the benefit coming from native identity-based network, under linguistic globalization, since the network benefit is not uniformly realised due to the alien norms in place, the net idiosyncratic cost (or benefit) is now reflected through z_G.

in the ability of N individuals to adopt the global language. Notice that, by construction, a positive proportion of the population will produce more under globalization than under autarchy, so long as the level economic participation remains positive. The lowest possible individual output, when the entire society globalizes and engages in production, is $k\alpha$, whereas all individuals produce kn under linguistic autarchy. Since by assumption $\alpha \in (0,1)$ and $n \geq 1$, we have $\frac{\alpha}{n} < 1$. Thus, globalization will be output-reducing for a positive proportion of society.

Our formulation incorporates two different features. First, individuals differ in terms of their ability to function productively within an alien linguistic-cultural tradition (e.g. Armstrong (2015) and Dasgupta (2017)). While some find great scope for more remunerative deployment of their effort in the expanded market that linguistic globalization offers, others are less able to take advantage of such opportunities due to their inherent difficulty in adjusting to an alien linguistic-cultural communicative environment. Thus, globalization opens up inequality within the globalizing society solely due to differential language learning and cultural adaptation abilities, and consequently differential ability to function productively an alien linguistic-cultural environment. Second, there exist community-level increasing returns to scale to productive participation in linguistic-cultural globalization. If a larger proportion of the community engages in economic activities mediated by global linguistic-cultural conventions, then each community member's productivity subsequent to globalization rises, due to positive externalities and spill-over effects within the community. This happens because the difficulty of economic functioning in an alien linguistic-cultural environment is lowered if a larger proportion of one's fellow community members are already so functional in that environment.

Recalling (5), given any level of engagement in production under globalization, θ_G, return from expropriation under globalization for the marginal individual, net of her return from production, is:

$$r = \frac{k{\theta_G}^{\alpha+1}(1-\gamma)}{1-\theta_G} - k\alpha\gamma{\theta_G}^{\alpha} = k{\theta_G}^{\alpha}(1-\gamma)[\frac{\theta_G}{1-\theta_G} - \frac{\alpha\gamma}{(1-\gamma)}]. \tag{6}$$

Then a unique equilibrium exists, given by: $\frac{\theta_G}{1-\theta_G} = \frac{\alpha\gamma}{(1-\gamma)}$, so that:

$$\theta_G = [\frac{\alpha\gamma}{(1-\gamma(1-\alpha))}]. \tag{7}$$

Clearly, the equilibrium is also stable. Notice that, by (7), $\theta_G < \gamma$ since $\alpha < 1$. Recalling (2) and (7), we thus have the following.

Remark 1. Linguistic globalization reduces the proportion of the productive population, commensurately increasing the proportion of the population engaged in expropriation, relative to the case under linguistic autarchy. The proportion of the population producing in equilibrium under globalization is increasing in α, γ.

Using (5) and (7), total output under linguistic globalization is:

$$Y_G = kn{\theta_G}^{\alpha+1} = kn[\frac{\alpha\gamma}{(1-\gamma(1-\alpha))}]^{\alpha+1}. \tag{8}$$

Using (3) and (8), output gap, i.e. total output under globalization net of output under autarchy, is:

$$\Delta Y_G \equiv Y_G - Y_T = kn^2\gamma\left[\left(\frac{1}{n\gamma}\right)(\theta_G)^{\alpha+1} - 1\right] = kn^2\gamma[\frac{\alpha}{n(1-\gamma(1-\alpha))}\left(\frac{\alpha\gamma}{(1-\gamma(1-\alpha))}\right)^{\alpha} - 1]. \tag{9}$$

The properties of the output gap ΔY_G are specified in Proposition 1 below.

Proposition 1. (i) $\lim_{\gamma\to 0} \Delta Y_G = 0$, $\lim_{\gamma\to 1} \Delta Y_G \leq 0$; (ii) for all $\gamma \in (0,1)$, $\Delta Y_G < 0$, (iii) if $\left[n \geq \left(1+\frac{1}{\alpha}\right)\right]$ then $\frac{\partial \Delta Y_G}{\partial \gamma} < 0$ for all $\gamma \in (0,1)$, and (iv) $\frac{\partial \Delta Y_G}{\partial k}, \frac{\partial \Delta Y_G}{\partial n} < 0$ for all $\gamma \in (0,1)$.

Proof of Proposition 1. Recalling that $n \geq 1$, part (i) of Proposition 1 follows immediately from (9). Now consider the term $Z \equiv \frac{\alpha}{(1-\gamma(1-\alpha))}\left[\frac{\alpha\gamma}{(1-\gamma(1-\alpha))}\right]^{\alpha}$. Then, from (9),

$$\frac{\partial \Delta Y_G}{\partial \gamma} = \frac{\Delta Y_G}{\gamma} + kn\gamma \frac{\partial Z}{\partial \gamma}. \tag{10}$$

Now,

$$\ln Z = \ln \alpha + \alpha \ln \alpha\gamma - (\alpha+1)\ln(1-\gamma(1-\alpha)),$$

so that:

$$\frac{\partial Z}{\partial \gamma} = \frac{Z(\alpha+(1-\alpha)\gamma)}{\gamma(1-\gamma(1-\alpha))} > 0. \tag{11}$$

Recall that, by (9), $\frac{\Delta Y_G}{\gamma} = kn^2[\frac{Z}{n} - 1]$. Thus, using (10) and (11),

$$\frac{\partial \Delta Y_G}{kn\partial \gamma} = Z[1 + \frac{(\alpha+(1-\alpha)\gamma)}{(1-\gamma(1-\alpha))}] - n. \tag{12}$$

Equation (12) implies that $\lim_{\gamma\to 0} \frac{\partial \Delta Y_G}{\partial \gamma} = -n < 0$, Clearly, $\frac{\partial^2 \Delta Y_G}{\partial \gamma^2} > 0$. Part (ii) of Proposition 1 then follows from part (i). Now notice that $\lim_{\gamma\to 1} \frac{\partial \Delta Y_G}{\partial \gamma} = \left(1+\frac{1}{\alpha}\right) - n$. Recalling that $\lim_{\gamma\to 0} \frac{\partial \Delta Y_G}{\partial \gamma} = -n < 0$ and $\frac{\partial^2 \Delta Y_G}{\partial \gamma^2} > 0$, part (iii) of Proposition 1 follows. Part (iv) follows immediately from (9) in light of Proposition 1(ii). ■

Figure 1: Output from globalization net of output under autarchy if $\left[\boldsymbol{n} \geq \left(\mathbf{1} + \frac{\mathbf{1}}{\boldsymbol{\alpha}}\right)\right]$

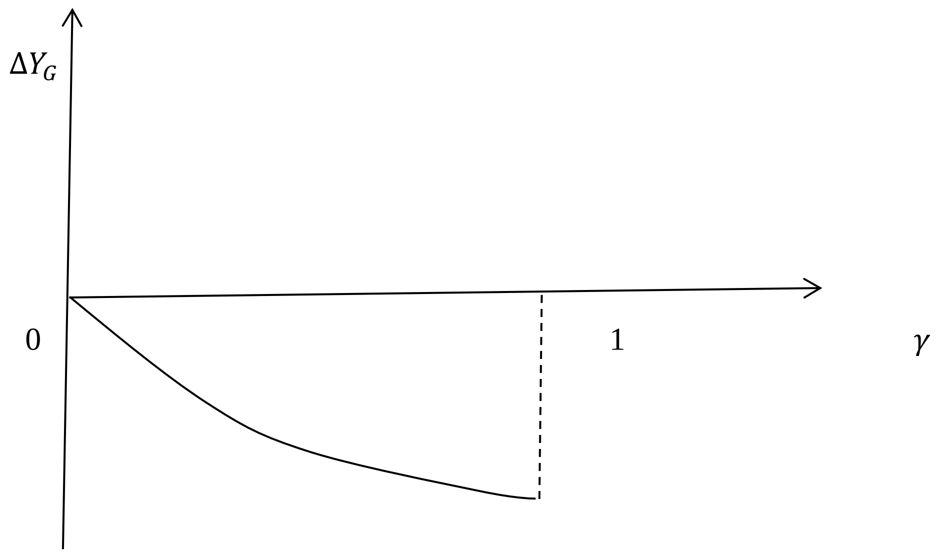
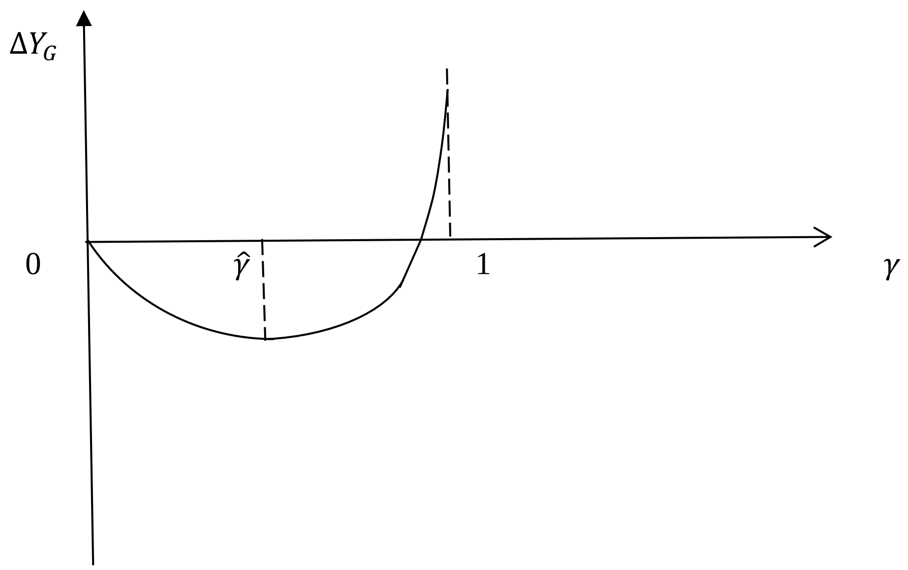


Figure 1 illustrates the behaviour of net output with changes in the extent of property rights protection, as summarized in Proposition 1.

By Proposition 1, linguistic globalization makes the globalizing society as a whole worse off. Thus, linguistic globalization is inefficient in a socially aggregative sense under our assumptions. Provided the linguistic community is sufficiently large, an improvement in property rights protection within the community makes linguistic autarchy more attractive, relative to globalization, to the society as a whole. Improvements in society-wide productivity levels and population increases have the same effect.

Remark 2. It can be checked that, if the linguistic community is relatively small, in the sense that $\left[n < \left(1 + \frac{1}{\alpha}\right)\right]$, then there must exist $\hat{\gamma} \in (0,1)$ such that $\frac{\partial \Delta Y_G}{\partial \gamma} < 0$ for all $\gamma \in (0, \hat{\gamma})$. Thus, a marginal improvement in property rights protection from an initial low level will continue to increase the aggregate social output from linguistic autarchy relative to linguistic globalization, as in Proposition 1(iii). However, at already high levels of such protection, further improvements will reduce the net aggregate social benefit from linguistic autarchy for relatively small linguistic communities. Net aggregate output must however continue to be higher under autarchy, compared to globalization, for any $\gamma \in (0,1)$ if (as assumed in our benchmark model) $n \geq 1$. If, in consonance with our maintained assumption $\frac{\alpha}{n} < 1$, we have $n \in (\alpha, 1)$, linguistic globalization will be socially beneficial, relative to autarchy, when property rights are sufficiently well protected. This case is depicted in Figure 2 in the next page.

Figure 2 Output from globalization net of output under autarchy if $\boldsymbol{n \in (\alpha, 1)}$.



Recall now that the lowest return received by an individual under linguistic-cultural globalization, net of her return under linguistic autarchy must be negative, under our maintained assumption $\alpha < n$. Thus, a positive proportion of the population must lose out from a shift to globalization. The income of the individual who receives identical amounts under globalization and autarchy must satisfy:

$$\left[k\alpha\tilde{\theta}_G{}^{\alpha-1}\right]\theta_G\gamma = kn\gamma. \tag{13}$$

From (13) we get the proportion of the population which gains from globalization:

$$\tilde{\theta}_G = (\left[\frac{\alpha}{n}\right]\theta_G)^{\frac{1}{1-\alpha}}. \tag{14}$$

Notice that, since $\frac{\alpha}{n} < 1$, and $\alpha \in (0,1)$, (14) implies $\tilde{\theta}_G < \theta_G$. Hence, the group of all individuals who would engage in expropriation under linguistic globalization (of population proportion $(1-\theta_G)$), and a sub-section of those who produce under linguistic globalization (of population proportion $(\theta_G - \tilde{\theta}_G)$, will together constitute the part of the society that would be made worse off by linguistic globalization. We shall term this losing group $\underline{N}$. Conversely, a sub-section of those who produce (of population proportion $\tilde{\theta}_G$) would be made better off. We shall term the gainer group $\overline{N}$.

The findings discussed above are illustrated for expository convenience in Figure 3 below, and, recalling Remark 1, (7) and (14), are summarized as follows.

Remark 3. Linguistic-cultural globalization increases the proportion of the population engaged in expropriation, relative to autarchy. All those who engage in in expropriation, and a section of those who engage in production, under such globalization constitute the sub-group ($\underline{N}$), all members of which would be better off under linguistic autarchy. The larger the population size (n), the smaller the population share of the sub-group of individuals who stand to benefit from such globalization ($\overline{N}$). The stronger the level of property rights protection (the higher the value of γ), the larger the population share of this sub-group $\overline{N}$.

Using (14), the income gain from linguistic globalization by the gainer group $\overline{N}$ relative to autarchy (represented by the vertically shaded area in Figure 3 below) is:

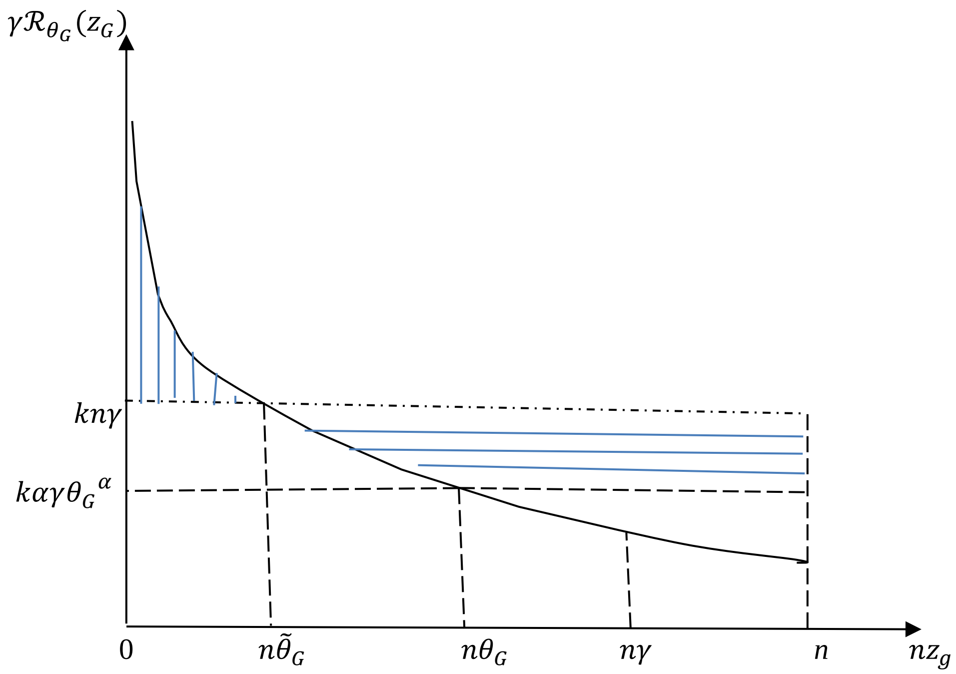
$$\Delta\overline{Y}_G = kn\gamma\tilde{\theta}_G\left[\frac{\theta_G}{\tilde{\theta}_G^{\,1-\alpha}} - n\right] = kn^2\gamma\left[\frac{1-\alpha}{\alpha}\right]\left(\left[\frac{\alpha}{n}\right]\theta_G\right)^{\frac{1}{1-\alpha}} = kn^{\left(\frac{1-2\alpha}{1-\alpha}\right)}\gamma(1-\alpha)\alpha^{\frac{\alpha}{1-\alpha}}(\theta_G)^{\frac{1}{1-\alpha}} > 0. \tag{15}$$

Income gain from linguistic globalization for the loser group $\underline{N}$ relative to autarchy (represented in absolute terms by the horizontally shaded area in Figure 3) is, recalling (9) accordingly:

$$\Delta\underline{Y}_G = \Delta Y_G - \Delta\overline{Y}_G = kn^2\gamma\left[\left(\frac{1}{n\gamma}\right)(\theta_G)^{\alpha+1} - (\theta_G)^{\frac{1}{1-\alpha}}\left(\frac{\alpha}{n}\right)^{\frac{1}{1-\alpha}}\left(\frac{1-\alpha}{\alpha}\right) - 1\right]$$

$$= kn^2\gamma\left[\frac{1}{n\gamma}\left(\frac{\alpha\gamma}{(1-\gamma(1-\alpha))}\right)^{\alpha+1} - \left[\frac{\alpha\gamma}{(1-\gamma(1-\alpha))}\right]^{\frac{1}{1-\alpha}}\left(\frac{\alpha}{n}\right)^{\frac{1}{1-\alpha}}\left(\frac{1-\alpha}{\alpha}\right) - 1\right] < 0. \tag{16}$$

Figure 3: Gainers and losers from linguistic globalization



2.2.2. Political determination of language policy

If costless compensatory transfers were feasible, which fully compensated all losing members of the community, maintaining the status quo situation of linguistic autarchy would be Pareto-improving. Suppose however that compensation is not feasible, due to say difficulties with assessing losses and problems with making binding commitments. Then language policy becomes a site of political contestation between the gainers and the losers. We now proceed to model such conflict in the first period. Let P be the probability of a policy shift to linguistic globalisation from an autarchic status quo:

$$P = \frac{\overline{x}}{\overline{x}+\underline{x}} \text{ if } x \equiv \overline{x} + \underline{x} > 0$$

$$= \frac{1}{2} \quad \text{otherwise;} \tag{17}$$

where $\overline{x}$ is the conflict/political expenditure by the gainer group $\overline{N}$, $\underline{x}$ is that by the loser group $\underline{N}$, and $x \equiv \overline{x} + \underline{x}$ is the total conflict expenditure in society. Such conflict (or political) expenditure involves the use of real resources in activities such lobbying the government, ;bribery, and direct action, including the possible use of violence. In standard fashion, we shall identity the intensity of linguistic conflict with the total expenditure incurred on such conflict (x). We shall assume that the two groups coordinate their actions within each group. Thus, in effect, there are two players in the first period conflict over language policy, who choose their conflict expenditures simultaneously. Each group is modelled as a risk neutral expected utility maximizer. The pay-off to the $\overline{N}$ group is therefore $[P\Delta\overline{Y}_G + \overline{Y}_T - \overline{x}]$, while the pay-off to the $\underline{N}$ group is $[P\Delta\underline{Y}_G + \underline{Y}_T - \underline{x}]$. Recall that linguistic globalization is inefficient in a socially aggregative sense for our case of a relatively large linguistic community (Proposition 1(ii)).

How does an improvement in property rights protection affect linguistic conflict and the probability of linguistic globalization?

Proposition 2. (i) P is increasing in γ and decreasing in n; (ii) if $\left[n \geq \left(1+\frac{1}{\alpha}\right)\right]$ then x is increasing in γ; and (iii) if $\left[\alpha \leq \frac{1}{2}\right]$, then x is increasing in n.

Proof of Proposition 2. The FOC for the coalition of losers, $\underline{N}$ is:

$$\left[\frac{-\overline{x}}{(\overline{x}+\underline{x})^2}\right][\Delta\underline{Y}_G] = 1. \tag{18}$$

The FOC for the coalition of winners, $\overline{N}$ is:

$$\left[\frac{\underline{x}}{(\overline{x}+\underline{x})^2}\right][\Delta\overline{Y}_G] = 1. \tag{19}$$

Thus,

$$\frac{\underline{x}}{\overline{x}} = \frac{-\Delta\underline{Y}_G}{\Delta\overline{Y}_G} = \frac{-\Delta Y_G}{\Delta\overline{Y}_G} + 1. \tag{20}$$

Using (9) and (15), $\frac{-\Delta Y_G}{\Delta\overline{Y}_G} = \frac{n^{\left(\frac{\alpha}{1-\alpha}\right)}\left[n-\frac{(\theta_G)^{1+\alpha}}{\gamma}\right]}{(\theta_G)^{\frac{1}{1-\alpha}}(1-\alpha)\alpha^{\frac{\alpha}{1-\alpha}}}$. By (7), $\frac{(\theta_G)^{1+\alpha}}{\gamma} = [\frac{\alpha^{1+\alpha}\gamma^{\alpha}}{(1-\gamma(1-\alpha))^{1+\alpha}}]$, which is increasing in γ. Recalling (7), it follows that $\frac{-\Delta Y_G}{\Delta\overline{Y}_G}$ is decreasing in γ. Hence $\frac{\underline{x}}{\overline{x}}$ is decreasing in γ, implying *P* is increasing in γ. Furthermore, (7) implies that $\frac{-\Delta Y_G}{\Delta\overline{Y}_G}$ is increasing in *n*, implying *P* is decreasing in *n*.

(ii) Recall that, from (18)-(19),

$$\frac{-\Delta \underline{Y}_G}{x} = [\frac{-\Delta \underline{Y}_G}{\Delta \overline{Y}_G} + 1].$$

Since, from part (i), $\frac{-\Delta \underline{Y}_G}{\Delta \overline{Y}_G}$ is decreasing in γ, $\frac{x}{-\Delta \underline{Y}_G}$ is increasing in γ. Now $\frac{\Delta \overline{Y}_G}{-\Delta Y_G}$ is increasing in γ. Hence, $\frac{-\Delta \underline{Y}_G}{-\Delta Y_G} = \left[\frac{\Delta \overline{Y}_G}{-\Delta Y_G} + 1\right]$ is increasing in γ. It follows that $\frac{x}{-\Delta Y_G}$ is increasing in γ. Recall now that, by Proposition 1(iii), $\frac{\partial \Delta Y_G}{\partial \gamma} < 0$ if $\left[n \geq \left(1 + \frac{1}{\alpha}\right)\right]$, and by Lemma 1(ii), $\Delta Y_G < 0$. It follows that x is increasing in γ if $\left[n \geq \left(1 + \frac{1}{\alpha}\right)\right]$.

(iii) Let $D \equiv \frac{-\Delta \underline{Y}_G}{\Delta \overline{Y}_G}$. Then, from (20), $\underline{x} = D\overline{x}$, so that $P = \frac{1}{1+D}$. Then, from (19), $x = (\frac{D}{1+D})[\Delta \overline{Y}_G]$. By (7) and (15), $\Delta \overline{Y}_G$ is non-decreasing in n if $\alpha \leq \frac{1}{2}$. Together, (7), (9) and (15) imply that *D* is increasing in *n*. Proposition 2(iii) follows. ■

Proposition 2(i) implies that better property rights protection increases the chances of the society adopting an inefficient language policy, i.e. linguistic globalization (recall Proposition 1(ii)). Intuitively, this happens because better property rights protection increases the gains of the winning group from linguistic globalization proportionately more than it increases the losses of the losing group. Political expenditure by the former consequently increases proportionately more than that by the latter. Recall that, when the linguistic community is sufficiently large, the net social cost of getting stuck in such an inefficient language policy regime rises with improved property rights protection (Proposition 1(iii)). Better property rights protection increases the winning group's gains from linguistic globalization, but the losing group suffers an even greater loss, so that net social loss from such globalization increases in consequence. It turns out that improved property rights protection also increases the extent of conflict over language policy, measured by the total resource wasted on such conflict in the first period, in this case (Proposition 2(ii)). The larger the population size, the smaller the population share of the sub-group which benefits from linguistic globalization (recall Remark 3), and the lower its gains, while the larger the relative size and the losses of the losing sub-group from such globalization. Hence the larger the population size, the lower the relative political investment by the former to influence policy in order to bring about globalization. Consequently, the larger the linguistic community, the lower the probability of linguistic globalization (Proposition 2(i)), and, given sufficiently high dispersion in the ability of N individuals to adopt the global language, the greater the extent of linguistic conflict (Proposition 2(iii)).

Remark 4. It can be shown that, if the linguistic community is relatively small, in the sense that $\left[n < \left(1 + \frac{1}{\alpha}\right)\right]$, then there must exist $\hat{\gamma} \in (0,1)$ such that aggregate linguistic conflict will increase with better property rights protection over $(0, \hat{\gamma})$. Thus, a marginal improvement in property rights protection from a low initial level will continue to exacerbate conflict over language policy and increase the net social cost due to linguistic globalization (recall Remark 2 and Figure 2). However, at already high levels of property rights protection, further improvements may reduce such conflicts when the linguistic community is relatively small.

2.3. Concluding remarks

In this paper, we have developed a simple model of within-group conflict over language policy that yields insights regarding the relationship between the likelihood of a linguistic community replacing its own language by a global language and conflict surrounding such replacement on the one hand, and the strength of property rights protection on the other. Our key findings relate to the possibility of an improvement in property rights protection making linguistic globalization more likely, even as marginal improvements in property rights protection from a low initial level increase the aggregate social loss from such a policy choice, relative to the autarchic status quo. Such improvements may also increase conflict over language policy. Our findings provide one possible rationalization of why languages and cultures of the colonizers continue to play a dominant, even expanding, role in the educational systems of most post-colonial developing societies, and why early post-independence attempts at cultural-linguistic indigenization of these systems were typically either reversed or slowed down subsequently. They also explain the continuing salience of cultural-linguistic indigenization as an item of political contestation in developing societies, by clarifying its redistributive role. The main policy implication of our analysis relates to the connection it establishes between property rights protection and the welfare consequences of educational indigenization: such indigenization may improve social welfare when weak institutions lead to weak property rights protection, but reduce it otherwise.

By focusing on a single linguistic community, we have abstracted from the possibility that a global language may be chosen as a conflict-reducing compromise in countries comprised of multiple language communities. How within-community language conflicts of the kind we have highlighted in this paper interact with and condition between-community language conflicts is an interesting question that may be fruitfully analysed in a more expansive formal model than the one we have attempted here. Second, the broad general structure of our model may also be applied to investigate other kinds of policy changes that generate both winners and losers within a community, such as trade liberalization and labour market deregulation. We look forward to these extensions and applications in future work.

Chapter III

Between-group contests over group-specific public goods with within-group fragmentation[9]

3.1. Introduction

When two communities compete for a politically determined division of some public good, how does coordination-inhibiting internal fragmentation within each community affect the outcome? Can greater fragmentation generate aggregate gains? Does greater asymmetry in internal fragmentation between the communities, i.e., one community becoming more fragmented even as its opponent consolidates, expand or reduce conflict, measured as total rent-seeking waste rather than production? How does it affect aggregate income? Does a community benefit when its opponent fragments? Perhaps most interestingly, can greater internal fragmentation benefit the fragmenting community itself? This paper addresses these issues.

The foregoing questions are particularly important in the context of the recent revival of ethnic identities, in the general sense of non-class (especially religious) cleavages. This revival has led mass political conflict to become more salient, both among rival ethnic groups and between religious and secular groups, over non-economic aspects of life. These inter-group conflicts often occur over issues of within-group, non-rival and non-excludable intrinsic benefits (culture/religion) rather than income, the consumption of which imposes collective

---

[9] This chapter has been co-authored with Prof. Indraneel Dasgupta. A version of this chapter has been published in *Public Choice*.

costs on members of another group. As Dasgupta and Kanbur (2005a, 2005b, 2007, 2011) have argued, identity groups can be visualized as being held together by the common consumption of certain forms of group-specific public goods. Such goods do not yield monetary benefits but are deemed intrinsically valuable by all group members. These very same group-specific public goods may, however, turn out to be public 'bads' for another identity group. Esteban and Ray (2011) and Dasgupta (2017) accordingly have modeled such collective consumption as generating conflict between groups.

For example, one group may pressure the state to impose a common secular legal code regarding marriage and sexual behaviour over an entire country, while another group wishes to impose religious (e.g., Sharia) law. The outcome is a composite legal code exhibiting both secular and religious features, with their proportions determined by the political efforts deployed by the contending groups. Ethnic—especially religious—communities typically espouse a set of core values and norms regarding the private behaviour of individuals. This is especially so in matters of marriage, sexual behaviour, divorce, abortion, inheritance, dietary habits, religious practices and dress codes for women. Stricter enforcement of such values and norms within the population at large then generates greater non-rival and non-excludable psychic benefits for individuals espousing those values. Different communities lobby authorities to act in their favour, for and against the status quo, or engage in direct action. Recent examples include mass protests for and against the slaughter of cows (in India), the placing of public statues (in Bangladesh), perceived blasphemy (in Pakistan and Europe) and the banning of polygamy and juvenile marriage (in many Muslim majority countries). Direct action may also involve the mobilization of militant activists. These activist groups may attempt to destroy places of worship or monuments erected by other communities, or to terrorize other groups, thereby forcing them to cease observing certain practices (e.g., consumption of beef or alcohol) and participating in rituals (e.g., the routine bombing of Shia processions and Sufi shrines by Salafists in Iraq and Pakistan). Such direct action is met with countervailing efforts to defend or promote another group's communal preferences.

All such inter-group conflicts may be thought of, in analytical terms, as occurring over the division of a public good between communities, the benefits of which are mutually exclusive between them, but are both non-rivalrous and non-excludable within a group. Inter-community conflicts also may occur over the sharing of state investment in public goods of localized benefit like schools, roads, hospitals, security, public art and local anti-pollution measures when the communities exhibit locational segregation. The second interpretation, in terms of political conflict over jurisdiction-specific local public goods, has been the one deployed originally in the literature (e.g., Katz et al. 1990; Ursprung 1990; Gradstein 1993), and is equally germane to our analysis.

Typically, in large diverse societies, two contesting groups also exhibit internal cleavages. Several examples of this phenomenon may be given: religious Hindus demanding tighter restrictions on cow slaughtering in India are fragmented along caste lines, while their opposition includes secularists, Muslims, Christians and Buddhists; local Pashtuns, Pakistani Pashtuns, non-Pashtun Pakistanis and Arab volunteers are all well-represented among the Taliban fighters in Afghanistan, while local Pashtuns, Tajiks, Hazaras and Uzbeks have constituted large fractions of Afghani government forces since the Taliban's overthrow in 2001; and both Christians and Muslims in Nigeria are internally fragmented along ethno-linguistic tribal lines. This common phenomenon of internal divisions (despite common interests) within both contending groups impedes internal coordination in conflicts with the opposing group. It is what motivates our analysis.

In recent years, a large literature has developed on how ethnic fragmentation (measured by the ethnic fractionalization index) and ethnic polarization affect social conflict.[10] However, internal cleavages within contending groups have not received attention in this literature. Nor has the question been addressed in the literature on the effectiveness of collective action stemming from the seminal contribution of Olson (1965) and synthesized by Esteban and Ray (2001), which investigates the consequences of contending groups' size asymmetries. Likewise, the literature on rent-seeking addressing group-specific public goods (e.g., Katz et al. 1990; Ursprung 1990; Gradstein 1993; Riaz et al. 1995; Baik 2008; Epstein and Mealem 2009; Lee 2012; Kolmar and Rommeswinkel 2013; Chowdhury et al. 2013) appears to have ignored the issue.[11] A parallel literature developing from the seminal contributions by Alesina et al. (1999) and Miguel and Gugerty (2005) emphasizes the typically negative impact of ethnic heterogeneity on local public goods provision. However, conflict among groups over sharing

[10] See Montalvo and Reynal-Querol (2012) for a recent survey.

[11] Katz et al. (1990) investigate the consequences of asymmetry in size and wealth between groups with and without risk aversion. Ursprung (1990) concentrates on rent dissipation. Gradstein (1993) focuses on the comparison between politically determined public provision and private provision of jurisdiction-specific local public goods. Riaz et al. (1995) consider a general expected utility setup with von Neumann-Morgenstern utility functions and highlight the consequences of changes in relative group size. Baik (2008) examines free riding with preference differences among group members assuming a linear utility function. Epstein and Mealem (2009) also focus on free riding. Lee (2012) offers a 'weakest-link' contest model over a group-specific public good, while Kolmar and Rommeswinkel (2013) develop the implications of a contest success function wherein individual group members' contest efforts aggregate to group conflict effort in a constant elasticity of substitution fashion. Chowdhury et al. (2013) examine free riding in 'best-shot' group contests over public goods. A broadly related contribution is by Cheikbossian (2008), who develops a linear utility model with preference differences and size asymmetries between groups, and examines how these factors affect politically determined public good provision. The public good, however, is not group-specific in his model.

such goods does not figure in those analyses. Our paper relates to all of those studies, while belonging most closely, in its formal structure, to previous work on rent-seeking in the context of group-specific public goods.

We model a situation wherein two communities of equal sized populations contest the division of a public good in standard Tullock (1980) fashion. Each community is fragmented into a finite number of subgroups, interpreted as factions. The number of constituent subgroups may vary across communities. The population share of the largest subgroup within a community is an inverse exponential function of the number of subgroups. Thus, the subgroups may, but need not, be of equal sizes within a community. Furthermore, the population share of the largest subgroup is smaller whenever the community is more fragmented. Each individual is endowed with one unit of effort, which she allocates between production for private consumption and contestation over the public good. Individuals' payoffs are given by an additively separable *total-income* function. This function has a linear component denoting the gain from private production. Thus, private output ('money') constitutes the numeraire good. The income function also has a non-linear component denoting the private-good valuation of the loss from the opposing community's share of the public good. Such loss is given specifically by an increasing, convex and iso-elastic *loss* function. This feature of endogenous marginal valuations of the public good distinguishes our model from most of the literature. The commonly used linear utility function (e.g., Katz et al. 1990; Baik 2008; Cheikbossian 2008; Lee 2012; Kolmar and Rommeswinkel 2013) is one limiting case in our model, and our payoff specification is, in turn, a sub-class of the general quasi-linear utility function used by Gradstein (1993).[12] Thus, an individual's payoff function simply provides

[12] Esteban and Ray (2001) also deploy a general quasi-linear utility function. However, the benefit from the public good is the linear component in their utility function, whereas it is the benefit from the private good that is

her total income, measured in units of the numeraire good, or ‘money’, by combining her private income with the monetary measure of the benefit from the public good.

Perfect coordination exists within each subgroup. Each subgroup thus can be modeled as an individual endowed with effort equal to its population share, maximizing the simple aggregate of the total incomes of all of its members, as given by their respective payoff functions. However, subgroups within a community cannot coordinate with one another, intuitively reflecting the consequences of linguistic, sectarian, clan or caste cleavages. All subgroups choose their effort allocations simultaneously. Thus, our model bears a resemblance to those advanced in the literature on simultaneous internal versus external rent-seeking (e.g., Hausken 2005; Münster 2007; Dasgupta 2009; Choi et al. 2016), but differs fundamentally from them in two ways. First, conflicts occur in these models solely over the sharing of private goods, whereas the sharing of a public good constitutes our locus of conflict. Second, unlike previous contributions, no explicit conflict emerges among constituent subgroups within a community in our model. Instead, internal cleavages affect external conflict solely through their impact on within-group coordination.

Examining the Nash equilibria, we find the following. The group that is more internally fragmented receives the smaller share of the public good. Given the extent of inter-community asymmetry in internal fragmentation, measured by the absolute difference in the number of subgroups, greater overall fragmentation (i.e., an increase in the total number of subgroups in society) reduces conflict and increases the aggregate income of the society. Conversely, given overall fragmentation, greater inter-community asymmetry in internal fragmentation increases conflict and reduces total income. The aggregate income of the more fragmented community

the linear component in ours. The benefit from the public good is assumed to be constant by Chowdhury et al. (2013) as well.

declines if it fragments even further. Surprisingly, however, the community that consolidates into fewer subgroups may be poorer in the aggregate as well. When the loss function is not too elastic and the largest subgroup within a community is not too large (i.e., for a certain range of parameter values), greater overall fragmentation implies less conflict and more income overall for the society. Any unilateral increase in fragmentation within a community (i.e., any unilateral increase in the number of its constituent subgroups) reduces conflict and makes its opponent richer. Strikingly, the community that becomes more fragmented also is richer when either the loss function is sufficiently elastic or the dominant subgroups within both communities are sufficiently large, though it is worse off otherwise. Thus, a smaller share of public good provisioning does not imply that the losing community's aggregate income is affected adversely: an aggregate income improvement for that community is consistent with such a reduction. Aggregate rent seeking increases when the dominant subgroups within both communities comprise larger population shares.

The intuition behind these findings is the following. Greater unilateral fragmentation within a community, by reducing internalization of community-wide benefits from the public good, reduces its allocation of political effort. That reallocation increases its private good output, which has a positive effect on the community's aggregate income. That group's share of the public good declines accordingly. The positive effect prevails when the loss function is sufficiently elastic or the dominant subgroups within both communities are sufficiently large. For the opponent of the community that unilaterally becomes more fragmented, the positive effect of receiving a larger public good share always dominates. The allocation of effort to political influence rises with larger population shares of dominant subgroups within both communities, since this increases the internalization of community-wide benefits from the public good.

Section 3.2 outlines our model. Our comparative static results are presented in Section 3.3. Section 3.4 discusses some possible variants and generalizations of the model. Section 3.5 concludes our paper. Detailed proofs of our formal results are provided in the Appendix.

3.2. The model

Consider a society with a population divided into two groups (or communities) M and N, with equal population shares. Total population is of measure 2, so that the size of each community is 1. Each community $c \in \{M, N\}$ is fragmented, i.e., partitioned into, a finite number of factions or subgroups $g_c \geq 1$. In the polar case of $g_c = 1$, the community is cohesive internally. Thus, the number of subgroups in M is g_M and that in N is g_N; g_M need not be equal to g_N. Subgroups within a community c are indexed by the elements of the set $\{1,2,\dots,g_c\}$. We denote the total number of subgroups in society by $G \equiv g_M + g_N$. We assume that $G \geq 3$ in order to make the analysis non-trivial. G measures overall fragmentation in society. The population size (or proportion) of a subgroup j in community c is p_{jc}, so that $\sum_{j=1}^{g_c} p_{jc} = 1$. We shall assume that the population size of the largest subgroup within a community, i.e., $Max\{p_{1c}, \dots, p_{g_c c}\}$, is $\frac{1}{{g_c}^{\gamma}}$, where $\gamma \in (0,1]$. The special case $\gamma = 1$ applies when each community is divided equally among its constituent subgroups. The smaller is γ, the greater is the population share of the largest subgroup (of which there may be more than one), i.e., the greater is its *dominance* within the community. Notice that we put no restrictions on the size of any subgroup except the largest.

Each individual in the society is endowed with one unit of effort that she can allocate between productive and rent-seeking activities to influence the cross-community division of one unit of a public good. Each subgroup within a community can coordinate its internal effort allocation decisions perfectly, so that it can be modeled as an individual endowed with effort p_{jc} , maximizing the total payoff to that subgroup. However, subgroups can neither coordinate effort allocation decisions with, nor internalize benefits accruing to, other subgroups. Therefore, each subgroup is fully centralized internally, but complete decentralization exists across subgroups.[13]

The marginal productivity of effort in private-output generating activities is $k > 0$. The total amount of effort allocated to political (i.e., rent-seeking) activities by a subgroup j in community c is denoted by x_{jc}; $x_{jc} \in [0, p_{jc}]$. Thus, the community as a whole allocates total political effort of $x_c \equiv \sum_{j=1}^{g_c} x_{jc}$. Private outputs produced by the subgroup and the community therefore are, respectively, $k(p_{jc} - x_{jc})$ and $k(1 - x_c)$. Total political effort in society is denoted by $X \equiv x_M + x_N$. The variable X measures social resource wastage owing to the diversion of effort to rent-seeking activities instead of production. In accordance with standard practice, we shall interpret this variable as the measure of conflict in society as well. Given any community $c \in \{M, N\}$, we shall refer to the other community as *–c*. The share of the public good received by community c is given by the standard Tullock (1980) contest success function:

$$\lambda_c = \frac{x_c}{X} \text{ if } X > 0, \text{ and } \lambda_c = \frac{1}{2} \text{ otherwise.} \quad (1)$$

---

[13] The idea we seek to highlight by adopting this formulation is that coordination is more effective within subgroups that share some immediately salient identity feature such as caste, clan or tribe, than across the wider communities within which they are embedded, on more distant or abstract grounds of common religion, political ideology or geographic location. Common consumption of certain forms of public goods generated by voluntary contributions of members provides an important resolution mechanism for *other* forms of collective action problems within such identity factions. We provide and discuss a formal defence of this contention in Section 4.4 below.

The payoff to an individual *i* belonging to subgroup *j* in community c is given by:

$$u_{ijc} = m_{ijc} + g[1 - (1 - \lambda_c)^{\alpha}],$$

where m_{ijc} is the amount of the private-output good received by her, g is the total amount of the public good, $m_{ijc}, g \geq 0$, and $\alpha > 1$. Thus, each individual receives some combination of two goods: a private-output numeraire good ('money') and the public good. Her payoff function provides the aggregation of this combination into her *total* income, measured in units of the numeraire good (i.e., in monetary units). The parameter α measures the elasticity of the *loss* function, $g(1 - \lambda_c)^{\alpha}$, with respect to the proportion of the public good lost to the other community. A larger α implies a smaller monetary value of the loss resulting from the other community receiving a given share of the public good. The payoff function converges to a linear form in the limiting case of unit elasticity ($\alpha = 1$). It converges to the case of the public good losing its group-specific character in the other limiting case of infinite elasticity ($\alpha \to \infty$).

The payoff to a subgroup *j* in community *c* is the aggregate of its members' payoffs. Since the total amount of the public good, *g*, is 1 by assumption, the subgroup payoff function takes the following form:

$$\pi_{jc} = k\left(p_{jc} - x_{jc}\right) + p_{jc}[1 - (1 - \lambda_c)^{\alpha}]. \tag{2}$$

Hence, the payoff to a community *c* is given by:

$$\pi_c \equiv \sum_{j=1}^{g_c} \pi_{jc} = 1 + k(1 - x_c) - (1 - \lambda_c)^{\alpha}. \tag{3}$$

The payoff to a subgroup is thus simply its aggregate income - the sum of its members' total incomes, measured in monetary units. The total payoff to a community is defined analogously.

All subgroups choose their political effort allocations simultaneously, so as to maximize the subgroup payoff function given by (2), subject to the contest success function

(1) and the subgroup effort constraint $x_{jc} \in [0, p_{jc}]$. It is evident from (2) that the marginal cost of political effort is identical for all subgroups within a community. However, the marginal benefit is higher, the larger is the size of the subgroup. It follows that the first-order condition can hold with equality only for the largest subgroup(s) within each community. Recall that the population of the largest subgroup(s) within a community is $\frac{1}{g_c{}^{\gamma}}$. Hence, we have the following equilibrium condition:

$$\frac{k g_c{}^{\gamma}}{\alpha} = (1 - \lambda_c)^{\alpha - 1} \left(\frac{x_{-c}}{X^2}\right). \tag{4}$$

Observation 1. Only the largest subgroup(s) within a community may allocate effort to rent seeking; all of the smaller ones must free ride on that effort and allocate their own efforts entirely to production. When multiple subgroups of the largest size exist within a community, some, but not all, of them may free-ride as well. When one largest subgroup exists uniquely, only that subgroup will engage in rent-seeking.[14]

Multiple equilibria emerge when more than one subgroup within a community are of the largest size. The special case of all subgroups being of equal size constitutes an extreme example. Political effort allocations of individual subgroups within the largest size category are indeterminate. However, the total political effort allocation by a community always is positive and uniquely determinate. From (4), using (1), we get:

[14] This is the analogue in our model of the result derived by Baik (2008) for his model of a group-contest for a group-specific public good wherein only the highest-valuation players expend positive effort and the rest expend zero effort in each group. That contribution uses a linear utility function and ignores within-group fragmentation.

$$x_{-c} = \left(\frac{k}{\alpha}\right)^{\frac{1}{\alpha}} g_c^{\frac{\gamma}{\alpha}} X^{\frac{1+\alpha}{\alpha}}. \tag{5}$$

Equation (5) yields total political effort expenditure in society:

$$X = \frac{\left(\frac{\alpha}{k}\right)}{[(g_c)^{\frac{\gamma}{\alpha}} + (g_{-c})^{\frac{\gamma}{\alpha}}]^{\alpha}}. \tag{6}$$

Together, (5) and (6) yield total political effort allocation by each community:

$$x_{-c} = \frac{\left(\frac{\alpha}{k}\right) g_c^{\frac{\gamma}{\alpha}}}{[(g_c)^{\frac{\gamma}{\alpha}} + (g_{-c})^{\frac{\gamma}{\alpha}}]^{\alpha+1}}. \tag{7}$$

In light of (1), (6)-(7) generate the equilibrium shares:

$$\lambda_c = \frac{1}{1 + \left(\frac{g_c}{g_{-c}}\right)^{\frac{\gamma}{\alpha}}}. \tag{8}$$

Remark 1. Equation (8) implies that $\lambda_c > \frac{1}{2}$ iff $g_{-c} > g_c$ and λ_c is decreasing in $\frac{g_c}{g_{-c}}$. Therefore, the community that is more internally fragmented receives less of the public good. The greater its internal fragmentation relative to that of its opponent, the less successful it is in rent-seeking. Recall that the size of the largest subgroup(s) within a community declines monotonically with its level of fragmentation. Hence, the community with the smaller-sized dominant subgroup receives the lesser share, but the number of dominant subgroups within a community does not affect its equilibrium share. Since $\frac{\lambda_c}{1-\lambda_c} = \left(\frac{g_{-c}}{g_c}\right)^{\frac{\gamma}{\alpha}}$, given relative fragmentation, the inter-community division of the public good is more equitable, the more elastic is the loss function. A larger loss elasticity makes shares less sensitive to relative fragmentation. Similarly, the larger the dominant subgroups (i.e., the smaller is γ), the more equal is the division.

3.3. Intra-community fragmentation and rent-seeking

How do aggregate social wastage from rent-seeking, total income of the society and its distribution between communities depend on intra-community fragmentation? We now proceed to answer these questions. For convenience, we recall that, by construction, $[g_M, g_N \geq 1]$, $\left[\frac{1}{G-1} \leq \frac{g_M}{g_N} \leq G-1\right]$, $[0 \leq |g_M - g_N| \leq G-2]$ and $[3 \leq G]$. All our formal statements below (Propositions 1 and 2 and Corollaries 1 and 2) are to be read as referring implicitly only to variable values and changes therein that satisfy these restrictions.

Proposition 1. (i) X declines with any increase in g_c. X falls with any increase in G given either g_M/g_N or $|g_M - g_N|$; it rises with any increase in $|g_M - g_N|$, given G.

(ii) Given any pair $\langle G_1, G_2 \rangle$, $G_1 > G_2$, there exists an $\varepsilon(G_1, G_2) \in (0,1]$ such that, for all $\langle \alpha, \gamma \rangle$ satisfying $[\alpha \in (1, 1 + \varepsilon(G_1, G_2))$ and $\gamma \in (1 - \varepsilon(G_1, G_2), 1]]$, X is smaller under G_1 relative to G_2.

(iii) Given any $\frac{g_c}{g_{-c}} \in (0,1]$, there exists an $\bar{\bar{\alpha}}\left(\frac{g_c}{g_{-c}}\right) \in (1, \infty)$ such that $[\frac{\partial X}{\partial \alpha} < 0$ if $\alpha > \bar{\bar{\alpha}}\left(\frac{g_c}{g_{-c}}\right)]$. The last term, $\bar{\bar{\alpha}}\left(\frac{g_c}{g_{-c}}\right)$, falls as $\frac{g_c}{g_{-c}}$ rises. Furthermore, $[\frac{\partial X}{\partial \alpha} > 0$ for all $\alpha \in (1, \bar{\bar{\alpha}}(1))]$ whenever $\frac{g_c}{g_{-c}} = 1$.

(iv) Given g_M and g_N, X increases with a reduction in γ.

Proof. See Appendix.

By Proposition 1(i), a unilateral increase in fragmentation within either community reduces rent seeking, or, equivalently, conflict. Given inter-community asymmetry in internal fragmentation, measured either as the absolute difference in the number of subgroups, or in relative terms, greater overall fragmentation reduces rent seeking. Conversely, given overall fragmentation, greater inter-community asymmetry in internal fragmentation (i.e., a rise in the absolute difference in the number of subgroups) increases rent-seeking effort. By (8), such an increase also leads to greater inequality in the division of the public good. Proposition 1(ii) implies that when the elasticity of the loss function is sufficiently low and the dominant subgroups are sufficiently small, greater overall fragmentation implies less aggregate rent seeking, regardless of how that fragmentation is distributed between the two communities. By Proposition 1(iii), given any level of relative fragmentation, there exists a certain threshold level of loss elasticity, above which more elastic loss implies less conflict monotonically. When the two communities are fragmented to the same extent, it also is the case that more elastic loss implies monotonically greater conflict at values of α close to unity. Hence, a marginal rise in the loss elasticity can move conflict in either direction, depending on its original value and the level of relative fragmentation. Given the number of subgroups within each community, more conflict emerges when the dominant subgroups are larger within both communities (Proposition 1(iv)).

The next question we turn to is the impact of intra-community fragmentation on total income, measured in units of the private-output numeraire good. Using (3), the total income of the society, i.e., the sum of the two communities' incomes, is given by:

$$\pi = 2 + k(2 - X) - [(1 - \lambda_M)^{\alpha} + \lambda_M{}^{\alpha}]. \tag{9}$$

The following conclusions can then be drawn in light of Proposition 1.

Corollary 1. (i) Given either g_M/g_N or $|g_M - g_N|$, any increase in G raises π; given G, any increase in $|g_M - g_N|$ lowers π.

(ii) Given any pair $\langle G_1, G_2\rangle$, $G_1 > G_2$, there exists an $\varepsilon(G_1, G_2) \in (0,1]$ such that, for all $\langle \alpha, \gamma\rangle$ satisfying [$\alpha \in (1, 1 + \varepsilon(G_1, G_2))$ and $\gamma \in (1 - \varepsilon(G_1, G_2), 1]$], π is higher under G_1 than under G_2.

Proof. See Appendix.

Corollary 1(i) implies that, given the extent of inter-community asymmetry in internal fragmentation, greater overall fragmentation increases total income by reducing rent seeking (and also by generating a more equal division of the public good when the absolute difference in fragmentation remains constant). Given overall fragmentation, greater inter-community asymmetry in internal fragmentation reduces total income both by increasing rent seeking and generating a more unequal distribution of the public good. Corollary 1(ii) implies that when the loss function exhibits sufficiently low elasticity and the dominant subgroups are sufficiently small, greater overall social fragmentation implies higher total income owing to reduced rent seeking, irrespective of the inter-community distribution of sub-groups.

By Proposition 1(i), conflict declines with greater unilateral fragmentation, i.e., a rise in g_c, given g_{-c}. Such greater fragmentation also generates a more equal division of the public good when $g_c < g_{-c}$ (Remark 1). It is therefore clear that greater unilateral fragmentation within the less fragmented community must make the society richer in the aggregate, i.e., increase its total income. By Corollary 1(ii), greater unilateral fragmentation within the more fragmented community also will raise total income when the elasticity of the loss function is sufficiently low and the dominant subgroups are sufficiently small. As we shall demonstrate, greater unilateral fragmentation within the more fragmented community must increase total income when the elasticity of the loss function is sufficiently large as well. However, whether it is possible to have a reduction in aggregate income from greater unilateral fragmentation within the more fragmented community for an intermediate range of elasticity values is an open question.[15]

Remark 2. By Corollary 1(i), the income maximizing combination of intra-communal fragmentation levels is given by $g_M = g_N$ when G is even, and by $g_M = \frac{G+1}{2}$ otherwise. It can be verified from (6), (8) and (9) that when $g_M = g_N$, total income falls as γ falls, i.e., as the dominant subgroups within both communities increase their population shares. This happens because larger dominant subgroups generate more conflict (Proposition 1(iv)). Therefore, given identical fragmentation within the two communities, total income is maximized when all subgroups are of equal size.[16]

Our next set of results characterizes how the distribution of total income between communities is affected by intra-community fragmentation. Recall that the total income of a community is measured simply by the sum of the total incomes of its constituent subgroups, as noted in (3) above.

[15] A general proof to the contrary has remained elusive so far, but so has an example of such a reduction.

[16] When the two communities are differentially fragmented ($g_M \neq g_N$), a rise in the population shares of the dominant subgroups (i.e., lower γ) has contradictory effects on total income. It increases conflict (Proposition 1(iv)), but generates a more equal division of the public good (Remark 1). The first effect reduces total income, while the second effect increases it.

Proposition 2.

(i) Given $\frac{g_M}{g_N}$, any increase in *G* increases both π_M and π_N. Given *G*, and given $\frac{g_c}{g_{-c}} \geq 1$, any increase in $\frac{g_c}{g_{-c}}$ reduces π_c. Given *G*, and given $\frac{g_c}{g_{-c}} < 1$, there exist $\breve{\alpha}, \tilde{\alpha} > 1$, with $\breve{\alpha} < \tilde{\alpha}$, such that any decline in $\frac{g_c}{g_{-c}}$ increases (respectively decreases) π_c if $\alpha < \breve{\alpha}$ (resp. $\alpha > \tilde{\alpha}$).

(ii) Given g_c, any increase in g_{-c} increases π_c.

(iii) Given any g_{-c} and any $\overline{g} \geq g_{-c}$, any increase in g_c over $[1, \overline{g}]$ increases π_c if $\left[\alpha > 2\left(\overline{g}^{\gamma}\right) - 1\right]$.

(iv) Given any g_{-c}, any increase in g_c over $[g_{-c}, \infty)$ reduces π_c if $[\alpha \leq 2({g_{-c}}^{\gamma}) - 1]$.

Proof. See Appendix.

By Proposition 2(i), an equiproportionate increase in fragmentation within both communities implies an aggregate income-improvement for both. Given total fragmentation, greater asymmetry in fragmentation across communities (a rise in the absolute difference in the number of subgroups) reduces the total income of the more fragmented community, when the number of subgroups in that community increases. Conversely, the aggregate income of its less fragmented opponent improves as the latter consolidates further, when the elasticity of the loss function is sufficiently small. Interestingly, however, the consolidating community suffers an aggregate reduction in its income if the loss elasticity is sufficiently large. Thus, when the loss elasticity is sufficiently large, greater asymmetry in fragmentation across communities makes *both* communities poorer in terms of aggregate income. Any unilateral increase in fragmentation within a community raises the total income of its opponent (Proposition 2(ii)). However, by Proposition 2(iii), the fragmented community is richer as well when the loss function is sufficiently elastic. In that case, unilateral fragmentation within one community leads to an aggregate income-improvement for both communities. On the other hand, the more fragmented community will be poorer in terms of aggregate income if it fragments even further when the loss elasticity is sufficiently small (Proposition 2(iv)).

Parts (iii) and (iv) of Proposition 2 can be clarified by an example. Suppose that $\alpha = 6, \gamma = \frac{1}{2}$; suppose further that *M* has at most nine subgroups, while *N* has fewer than nine subgroups. Then Proposition 2(iii) implies that any unilateral increase in the number of subgroups comprising *N* will improve the aggregate incomes of both *N* and *M*, provided that such an increase produces at most nine subgroups within *N*. Now suppose that *M* acquires exactly 16 subgroups, and *N* has at least 16 subgroups. Then Proposition 2(iv) implies that any further fragmentation within *N* must reduce its aggregate income, while improving that of *M*. The same outcome will be obtained if *M* has any number of subgroups greater than 16, say *m*, and *N* fragments further, from an initial situation where it has at least *m* subgroups.

Parts (iii) and (iv) of Proposition 2 immediately yield the following corollary.

Corollary 2.

(i) Given any g_{-c}, any $\overline{g} \geq g_{-c}$ and any $\alpha > 1$, there exists a $\hat{\gamma} \in (0,1]$ such that any increase in g_c over $[1, \overline{g}]$ increases π_c when $\gamma < \hat{\gamma}$.

(ii) Given any $\alpha > 1$ and any $\gamma \in (0,1]$, there exists a $\tilde{\hat{g}}_{-c}$ such that any increase in g_c over $[\tilde{\hat{g}}_{-c}, \infty)$ reduces π_c.

Proposition 2(ii) and Corollary 2(i) together imply that given any elasticity of the loss function, a unilateral increase in fragmentation within a community will make both communities richer overall whenever the dominant subgroups are sufficiently large. The more fragmented community will be poorer overall by fragmenting further, irrespective of the values of the parameters γ and α, when its opponent is sufficiently fragmented (Corollary 2(ii)).

The intuition behind these findings is that greater unilateral fragmentation within a community, by reducing internalization of community-wide benefits from the public good, reduces its political effort allocation. That reallocation increases its productive output, which has a positive effect on that community's aggregate income. The larger is the relative population share of the dominant subgroup within a community, the more significant this positive effect will be. Of course, the reallocation to productive effort also has a negative consequence: it reduces the fragmented community's share of the public good. The negative effect dominates at low values of α (high values of γ, or both) while the positive effect dominates otherwise. For the opponent of the unilaterally fragmenting community, the positive effect of capturing a larger share of the public good always dominates. Now consider the case wherein the more fragmented community fragments further, while its opponent consolidates in a compensating fashion, so as to keep the overall magnitude of fragmentation constant. The overall effect on aggregate income is always negative for the former in this case. However, the less fragmented community, by consolidating further, imposes an income loss on itself when the loss elasticity is sufficiently large. This loss may outweigh the gain it achieves from its opponent fragmenting further.

Remark 3. Proposition 2(iv) implies that greater unilateral fragmentation must unconditionally make the fragmenting community poorer when preferences are linear, as is commonly assumed in the literature (e.g., Katz et al. 1990; Baik 2008; Cheikbossian 2008 Lee 2012; Kolmar and Rommeswinkel 2013).

3.4. Variants

We now proceed to outline some possible variants and extensions of our model.

3.4.1. Discrete populations

Our model assumes a continuum of population sizes. That was purely for convenience of exposition. One can construct a discrete population version of the model with total population given by some even number $P \geq 4$, with each community having $\frac{P}{2}$ members. Under the assumption of equal population shares for all subgroups within a community, this version is especially useful for comparing the two polar cases of complete centralization ($g_c = 1$) and complete decentralization ($g_c = \frac{P}{2}$) within a community. Complete centralization within both communities has sometimes been studied in contraposition to complete decentralization within both communities (e.g., Cheikbossian 2008). It can be shown that aggregate conflict is lower, aggregate income higher, and both communities are richer, if both communities are completely decentralized, relative to the case where both are completely centralized. As in our benchmark model, unilateral fragmentation by a community increases the income of its opponent. The fragmenting community itself is richer if the loss function is sufficiently elastic. Specifically, it can be shown that given any $g_{-c} \in [1, \frac{P}{2}]$, π_c is increasing in g_c over $[1, \frac{P}{2}]$ if $\alpha > P - 1$. All other substantive findings continue to hold as well.

3.4.2. Preference differences across subgroups

Assuming equal population sizes $(\frac{1}{g_c})$ across sub-groups, the model can be augmented to include differences in valuations across subgroups within a community. We can amend the subgroup payoff function in (2) to:

$$\pi_{jc} = k(p_{jc} - x_{jc}) + [1 - (1 - \lambda_c)^{\alpha}]\left(\frac{R_{jc}}{g_c}\right).$$

The subgroup-specific parameters R_{jc} then capture possible differences in valuations of the public good across subgroups. Defining R as the maximum value of the subgroup valuation parameter, we may assume that the maximum remains constant across communities, regardless of the level of fragmentation (i.e., for all $c \in \{M, F\}$ and all $g_c \geq 1,\ R = Max\{R_{1c}, \dots, R_{g_c c}\}$). Our analysis of the impact of fragmentation on conflict and equilibrium shares remains substantively unchanged under this alternative formulation.

3.4.3. General contest success function

Our contest success function in (1) can be generalized to the form:

$$\lambda_c = \frac{{x_c}^{\varepsilon}}{{x_c}^{\varepsilon} + {x_{-c}}^{\varepsilon}},$$

where $\varepsilon \in (0,1]$. It is intuitively evident that while greatly increasing the notational burden, this generalization does not yield any additional substantive insights.

3.4.4. A two-stage expansion

We have assumed perfect coordination within subgroups in our model. Of course, within-subgroup coordination is likely to be less than perfect in practice. What we wish to highlight by our abstraction, however, are two broad intuitive and empirically plausible ideas. First, coordination is likely to be more effective within subgroups or factions that share some immediately salient endogamy-encouraging identity features such as caste, clan, language or tribe, than across broader constituent communities within which they are embedded, on more distant or abstract grounds of common religion, political ideology or geographic location. It is the greater effectiveness of within-subgroup coordination that intuitively demarcates historically stable identity factions within a broader community from any arbitrary population partitioning of the latter. Second, common consumption of certain forms of public goods generated by voluntary contributions of members provides an important mechanism for resolving *other* forms of collective action problems within such identity factions and thereby helps explain their stability.

The second point requires elaboration. Dasgupta and Kanbur (2005a, 2005b, 2007, 2011) have modeled a community as held together by voluntary contributions to a community-specific public good. Extending their argument, we can think of a faction (i.e., a subgroup) within a community as defined by common consumption of a faction-specific pure public good, generated by voluntary contributions from faction members, which is, however, not valued by the members of other factions. For example, when a religious community is fragmented internally into different ethno-linguistic factions, each faction may be held together internally by the common enjoyment of ethnic festivals and rituals to which at least some faction members contribute.[17] Such contributions may motivate individuals not to engage in opportunistic actions that reduce the welfare of other members of their own identity faction.

A formal sketch of this idea may proceed by solving a two-stage game as follows. In the first stage, all factions engage in the inter-community contest according to our benchmark

[17] See Dasgupta and Kanbur (2007) for a number of illustrative examples in different social contexts.

model in Section 2. However, all individuals choose their own political efforts. In the second stage, each faction engages in its internal game of simultaneous voluntary contributions to its own faction-specific public good. Individual private incomes in stage 2 are the sum of the private productive income earned in stage 1, as specified in our benchmark model, and an exogenously given second-stage private income. All consumption is realized at the conclusion of stage 2. The utility function of an individual *i* belonging to the sub-group *j* of community c is given by:

$$U_{ijc} = \beta \ln W_{ijc} + (1-\beta)\ln\left(z_{jc}\right),$$

where $\beta \in (0,1)$ and z_{jc} is the amount of a pure public good Z_{jc}, specific to the subgroup, available to all subgroup members. The variable W_{ijc} is a composite of private consumption (q_{ijc}) and the benefit from the community-specific public good accruing to the individual in consequence of the first period contest, when the latter is assumed to be non-pecuniary (say, cultural or religious) in nature. Thus, $W_{ijc} \equiv q_{ijc} + [1 - (1-\lambda_c)^{\alpha}]$. When the benefit from the community-specific public good is assumed to be monetary, say because it takes the form of jurisdiction-specific infrastructure spending, which augments the stage 2 income of every individual community member i of community c by a lump-sum equal to $[1 - (1-\lambda_c)^{\alpha}]$, the variable W_{ijc} itself is interpreted as total private consumption. The total amount contributed for production of Z_{jc} by all members of the subgroup other than *i* is $z_{-i,jc}$. All prices are assumed to be unity purely for notational simplicity. The total amount of the subgroup-specific public good generated is thus given simply by the total monetary contribution, so that $z_{jc} \equiv \left(z_{i,jc} + z_{-i,jc}\right)$.

Assume that a symmetric equilibrium holds in the stage 1 inter-group contest modeled in Section 2, in the sense that every subgroup member expends the same amount of political effort, $\frac{x_{jc}}{np_{jc}}$, where n is the total population of the community and p_{jc} is the proportion of that population belonging to subgroup j. Each individual's problem in the game of simultaneous voluntary contributions to the subgroup-specific public good in stage 2 is, therefore:

$$\underset{z_{jc}}{Max}\, \beta \ln W_{ijc} + (1-\beta) \ln z_{jc};$$

subject to the budget constraint:

$$W_{ijc} + z_{jc} = \left[k\left(1 - \frac{x_{jc}}{np_{jc}}\right) + (1 - (1-\lambda_c)^{\alpha}) + \bar{I}_{jc}\right] + z_{-i,jc},$$

where $\bar{I}_{jc}$ is the exogenously given second-stage private income of each individual member of subgroup j in community c, and the additional constraint:

$$z_{jc} \geq z_{-i,jc}.$$

The second constraint merely implies that individuals cannot convert public good contributions by others into their own private consumption. When the benefits from the community-specific public good are assumed to be non-pecuniary in nature, we also need to impose another constraint, namely, that private consumption (q_{ijc}) is non-negative, i.e.,

$$W_{ijc} \geq [1 - (1-\lambda_c)^{\alpha}].$$

When such benefits are assumed to be income augmenting, the third constraint is redundant. It is apparent that in any second-stage subgame wherein all subgroup members have identical incomes (itself a consequence of choosing identical actions in stage 1), the unique Nash equilibrium must involve positive and identical contributions by all subgroup members to the subgroup specific public good. It is equally apparent that when the third constraint is imposed, private consumption must be positive if $\bar{I}_{jc}$ is sufficiently large. Assuming an interior solution, so that the third constraint does not bind, the first-order condition implies that:

$$W_{ijc} = z_{jc}\left(\frac{\beta}{1-\beta}\right).$$

That relation must hold automatically if the benefits from the community-specific public good are assumed to be monetary in form, so that the third constraint is dispensed with. In either case, summing the budget constraint over all members of the subgroup, the unique Nash equilibrium is characterized by:

$$z_{jc} = \frac{np_{jc}\bar{I}_{jc} + \left[k\left(np_{jc} - x_{jc}\right) + np_{jc}\left(1 - (1-\lambda_c)^{\alpha}\right)\right]}{\left[np_{jc}\left(\frac{\beta}{1-\beta}\right) + 1\right]} = W_{ijc}\left(\frac{1-\beta}{\beta}\right).$$

It follows that each subgroup member's equilibrium consumption of either good in the second stage subgame is a positive linear function of the expression $\left[k\left(np_{jc} - x_{jc}\right) + np_{jc}\left(1 - (1-\lambda_c)^{\alpha}\right)\right]$, which is nothing but the total stage 1 private income of the subgroup, plus the total private-income equivalent of the benefits received from the public good in stage 1 by its members. Normalizing the community population size *n* to unity, we then get the subgroup payoff function in (2).

Maximizing the expression $\left[k\left(p_{jc} - x_{jc}\right) + p_{jc}\left(1 - (1-\lambda_c)^{\alpha}\right)\right]$ (i.e., total subgroup income) in stage 1, as assumed in our benchmark model, is individually rational when: (a) our benchmark model is viewed as the opening stage of the more elaborate game discussed here, and (b) the symmetric equilibrium incomes and between-group public good division generated in stage 1 lead to a Nash equilibrium with positive private consumption in the second stage game of public good provisioning within each subgroup. Suppose that an individual deviated unilaterally in stage 1, by increasing her personal payoff at the cost of reducing the total subgroup payoff. Then all other members of the subgroup would respond by reducing their contributions to the faction-specific public good in stage 2. So long as all such members continue to contribute positive amounts in stage 2, which must happen whenever $\bar{I}_{jc}$ is sufficiently large, the deviant individual's gains in stage 1 would be more than offset in consequence, making her worse off.[18] Maximizing the total subgroup payoff in stage 1 by every individual can therefore be sustained as part of a subgame perfect Nash equilibrium in the two-stage game. Condition (b) will hold automatically when the benefits from the community-specific public good are assumed to be monetary in form. It will hold otherwise, provided that stage 2 income $\bar{I}_{jc}$ is assumed to be sufficiently large. That consideration underlies and motivates the formulation in our benchmark model that individuals can perfectly coordinate their actions within each subgroup.[19]

---

[18] This argument is a direct application of the well-known neutrality property of games of voluntary contributions to pure public goods, first characterized by Bergstrom et al. (1986). The neutrality property implies that contributors to such public goods do not have any incentive to expropriate one another, since any income gain by the expropriator would be neutralized by a fall in public good contributions by the expropriated, leaving individual consumption bundles unchanged. See Dasgupta and Kanbur (2007) for a discussion.

[19] Our log-linear choice of the utility function in stage 2, while helpful for expositional transparency, is not crucial to our argument. Any utility function that is homothetic in W_{ijc} and z_{jc} evidently would work as well. The assumption that the stage 2 utility function $U_{jc}(W_{ijc}, z_{jc})$ is such as to make both its arguments strictly normal goods suffices to ensure the uniqueness of the Nash equilibrium in the stage 2 subgame. Additionally, this assumption implies that each subgroup member's equilibrium consumption is an increasing function of $[k(np_{jc} - x_{jc}) + np_{jc}(1 - (1 - \lambda_c)^{\alpha})]$, given positive private consumption and positive contributions. Both claims follow immediately from the seminal analysis by Bergstrom et al. (1986). If we assume the stage 2 utility function to be of the quasi-linear form $[\beta W_{ijc} + z_{jc}{}^{\varphi}]$ where $\beta > 0$ and $\varphi \in (0,1)$, the equilibrium quantity of the public good remains unchanged despite an increase in any individual's income (assuming an interior solution, i.e., positive private consumption). Individual contributions are indeterminate. However, total public good provision in stage 2 is determinate and independent of total subgroup payoff in stage 1. Hence, if we assume equal contributions and an interior solution in stage 2, then every individual is better off by increasing her own stage 1 payoff, even if doing so reduces total subgroup payoff. However, that problem does not arise if we choose any stage 2 utility function from within the class $[\beta W_{ijc}{}^{\vartheta} + z_{jc}{}^{\varphi}]$, where $\beta > 0, \varphi \in (0,1)$ and $\vartheta \in (0,1)$. The

The assumption of identical preferences within a subgroup in the stage 2 subgame simplifies the algebraic exposition, but is not fundamental to our argument. The following example illustrates this point. Consider a subgroup j in community c consisting of exactly two individuals, 1 and 2, with utility functions $\left[\beta_1 \ln W_{1jc} + (1-\beta_1)\ln z_{jc}\right]$ and $\left[\beta_2 \ln W_{2jc} + (1-\beta_2)\ln z_{jc}\right]$, respectively. Assume that the benefits from the community-specific public good are monetary in form, so that condition (b) holds automatically. It can be verified that, if $\beta_1 = \frac{1}{2}$ and $\beta_2 \in (0, \frac{2}{3})$, then both individuals' equilibrium consumption bundles in the stage 2 subgame must be given by positive linear functions of the total subgroup income in stage 1.

Notice that the amount of the public good generated through voluntary contributions in stage 2 of our extended model is inefficiently small. Nonetheless, the process of its generation provides a mechanism to eliminate inefficiency in the allocation of subgroup political effort to the stage 1 contest. Therefore, the same subgroup or identity faction may exhibit tight levels of internal coordination in some of its activities—especially those relevant for success in conflict with another group—even as it suffers from extensive under-provisioning with regard to other activities important for the well-being of its members. Efficiency in external conflict need not imply efficiency in internal provisioning.

3.5. Concluding remarks

We have examined the impact of coordination-inhibiting within-community cleavages on intra-community conflict over sharing of a public good. We have found that having more such divisions may be socially beneficial, in that it may reduce inter-community conflict and

---

quasi-linear form is a limiting case of this class. It follows that an arbitrarily close approximation of quasi-linear preferences is compatible with our analysis, but not exact linearity in W_{ijc}.

increase the total income of the society. Greater unilateral fragmentation within one community makes the other richer. Greater unilateral fragmentation may make the fragmenting community itself richer as well, even though as a result that community receives a smaller share of the public good. Thus, the fact of losing out on public goods provisioning does not lead to unambiguous income implications: the losing/fragmenting community may become richer overall nonetheless. Sub-communal identity politics, such as caste exclusivism among Hindus in India and ethno-linguistic assertion among Muslims and Christians in large regions of Africa, seek to highlight and emphasize ethnic, linguistic, regional, clan or caste divisions and distinctions within a broader religious community. Our analysis suggests the intriguing possibility that such internally divisive politics may actually work to the overall benefit of the broader community when that community is in conflict with another community—even if such politics tilt the outcome of the inter-community conflict against the former. Furthermore, we have found that inter-group conflict increases as the dominant subgroups within both communities increase their population shares relative to the average subgroup population. That hypothesis can usefully be confronted with empirical evidence.

The literature on simultaneous between and within group contests (e.g., Hausken 2005; Münster 2007; Dasgupta 2009; Choi et al. 2016) typically models conflicts solely over private goods. However, one may visualize a scenario wherein two communities contest the division of a public good even as all of its constituent subgroups individually contest the distribution of private consumption alongside their engagement in productive activity. One may examine the impact of within-group fragmentation in such a context. In addition, one may use alternatives to our perfect-substitutes summary specification for each community's aggregate group conflict effort, such as a constant elasticity of substitution aggregation (Kolmar and Rommeswinkel 2013), the best-shot specification (Chowdhury et al. 2013) or the weakest-link formulation (Lee 2012). The consequences of within-group fragmentation in such contests over group-specific public goods constitute another promising avenue of future enquiry. Lastly, by focusing on shares rather than success probabilities, we have abstracted from risk-related issues. Explicit incorporation of risk aversion and of wealth effects on risk aversion (along the lines, for example, of Katz et al. 1990) may yield useful insights. We look forward to these and other extensions in future work.

Appendix

Proof of Proposition 1. That X declines with any increase in g_c, and that it declines with any increase in G, given g_M/g_N, follow from (6). Let $\Delta \equiv g_c - \frac{G}{2} \geq 0$ for some $c \in \{M, N\}$. Consider the term $[(g_M)^{\frac{\gamma}{\alpha}} + (g_N)^{\frac{\gamma}{\alpha}}]$, which can be rewritten as: $\left[\left(\Delta + \frac{G}{2}\right)^{\frac{\gamma}{\alpha}} + \left(\frac{G}{2} - \Delta\right)^{\frac{\gamma}{\alpha}}\right]$. Since $\gamma \leq 1$ and $\alpha > 1$, $\left[\left(\Delta + \frac{G}{2}\right)^{\frac{\gamma}{\alpha}} + \left(\frac{G}{2} - \Delta\right)^{\frac{\gamma}{\alpha}}\right]$ is falling in Δ, and rising in G. Proposition 1(i) follows in light of (6).

Notice now that $\lim_{\frac{\gamma}{\alpha} \to 1} \left[\left(\Delta + \frac{G}{2}\right)^{\frac{\gamma}{\alpha}} + \left(\frac{G}{2} - \Delta\right)^{\frac{\gamma}{\alpha}}\right] = G$, so that $\lim_{\alpha, \gamma \to 1} X = \left(\frac{1}{Gk}\right)$. Proposition 1(ii) follows by continuity and (6).

Now note that $\frac{\partial\left((g_c)^{\frac{\gamma}{\alpha}}\right)}{\partial \alpha} = \frac{-\gamma (g_c)^{\frac{\gamma}{\alpha}} \ln g_c}{\alpha^2}$. Let $Z \equiv [(g_c)^{\frac{\gamma}{\alpha}} + (g_{-c})^{\frac{\gamma}{\alpha}}]^{-\alpha}$. Then:

$$\frac{1}{Z}\frac{\partial Z}{\partial \alpha} = -\ln[(g_c)^{\frac{\gamma}{\alpha}} + (g_{-c})^{\frac{\gamma}{\alpha}}] + \frac{\left(\frac{\gamma}{\alpha}\right)\left[(g_c)^{\frac{\gamma}{\alpha}} \ln g_c + (g_{-c})^{\frac{\gamma}{\alpha}} \ln g_{-c}\right]}{[(g_c)^{\frac{\gamma}{\alpha}} + (g_{-c})^{\frac{\gamma}{\alpha}}]}.$$

Assume, without loss of generality, that $g_{-c} \geq g_c$. Then:

$$-\ln[(g_c)^{\frac{\gamma}{\alpha}} + (g_{-c})^{\frac{\gamma}{\alpha}}] + \ln(g_c)^{\frac{\gamma}{\alpha}} \leq \frac{1}{Z}\frac{\partial Z}{\partial \alpha} \leq -\ln[(g_c)^{\frac{\gamma}{\alpha}} + (g_{-c})^{\frac{\gamma}{\alpha}}] + \ln(g_{-c})^{\frac{\gamma}{\alpha}} =$$

$$\ln\left(\frac{(g_{-c})^{\frac{\gamma}{\alpha}}}{(g_c)^{\frac{\gamma}{\alpha}} + (g_{-c})^{\frac{\gamma}{\alpha}}}\right) < 0.$$

Recalling that $Z \equiv [(g_c)^{\frac{\gamma}{\alpha}} + (g_{-c})^{\frac{\gamma}{\alpha}}]^{-\alpha}$, the inequality above can therefore be rewritten to yield:

$$\left[Z\ln(Z{g_c}^{\gamma})^{\frac{1}{\alpha}} \leq \frac{\partial Z}{\partial \alpha} \leq Z\ln(Z{g_{-c}}^{\gamma})^{\frac{1}{\alpha}} < 0\right].$$

Since, by (6), $[kX = \alpha Z]$, so that $\left[k\frac{\partial X}{\partial \alpha} = Z + \alpha\frac{\partial Z}{\partial \alpha}\right]$, we thus get:

$$Z(1 + \ln(Z{g_c}^{\gamma})) \leq k\frac{\partial X}{\partial \alpha} \leq Z(1 + \ln(Z{g_{-c}}^{\gamma})).$$

Hence, $\frac{\partial X}{\partial \alpha} < 0$ if $\ln(Z{g_{-c}}^{\gamma}) < -1$, i.e. if $Z{g_{-c}}^{\gamma} < \frac{1}{e} < \frac{1}{2}$. Notice now that $Z{g_{-c}}^{\gamma} = \left(\frac{1}{\left(\frac{g_c}{g_{-c}}\right)^{\frac{\gamma}{\alpha}} + 1}\right)^{\alpha}$. Since $\frac{g_c}{g_{-c}} \leq 1$, $\lim_{\alpha \to 1} Z{g_{-c}}^{\gamma} \geq \frac{1}{2}$, and, given any $\frac{g_c}{g_{-c}} \in (0,1]$, $\lim_{\alpha \to \infty} Z{g_{-c}}^{\gamma} = 0$. Furthermore, $\frac{\partial Z}{\partial \alpha} < 0$. Hence, there must exist an $\bar{\bar{\alpha}}\left(\frac{g_c}{g_{-c}}\right) \in (1, \infty)$ such that $\ln(Z{g_{-c}}^{\gamma}) = -1$ when $\alpha = \bar{\bar{\alpha}}\left(\frac{g_c}{g_{-c}}\right)$. It follows that $\frac{\partial X}{\partial \alpha} < 0$ if $\alpha > \bar{\bar{\alpha}}\left(\frac{g_c}{g_{-c}}\right)$. Since $Z{g_{-c}}^{\gamma}$ falls as $\frac{g_c}{g_{-c}}$ rises, and $\frac{\partial Z}{\partial \alpha} < 0$, $\bar{\bar{\alpha}}\left(\frac{g_c}{g_{-c}}\right)$ falls as $\frac{g_c}{g_{-c}}$ rises. Now, $\frac{\partial X}{\partial \alpha} \leq 0$ only if $\ln(Z{g_c}^{\gamma}) \leq -1$, i.e., only if $Z{g_c}^{\gamma} \leq \frac{1}{e} < \frac{1}{2}$. Notice that $\lim_{\alpha \to 1} Z{g_c}^{\gamma} \leq \frac{1}{2}$, with the equality holding when $g_c = g_{-c}$. Hence, $\lim_{\alpha \to 1}\frac{\partial X}{\partial \alpha} > 0$ when $\left(\frac{g_c}{g_{-c}}\right) = 1$. Part (iii) of Proposition 1 follows.

Recalling that $G \geq 3$ by assumption, part (iv) of Proposition 1 follows immediately from (6).

•

Proof of Corollary 1. Assume, without loss of generality, that $\lambda_c > \frac{1}{2}$. Consider the term $D \equiv (1-\lambda_c)^\alpha + (\lambda_c)^\alpha$. Since $\alpha > 1$, $\frac{\partial D}{\partial \lambda_c} > 0$. Now recall that, by (8), an increase in $|g_M - g_N|$ with a given *G* and a decrease in *G* with a given $|g_M - g_N|$ must both increase λ_c. Part (i) of Corollary 1 then follows from Proposition 1(i) and (9).

Now recall that, using (4), the FOCs yield:

$$\frac{k(g_c{}^\gamma + g_{-c}{}^\gamma)X}{\alpha} = (1-\lambda_M)^\alpha + (\lambda_M)^\alpha. \tag{10}$$

Together, (9) and (10) yield:

$$\pi = 2 + k\left[2 - X[1 + \frac{(g_c{}^\gamma + g_{-c}{}^\gamma)}{\alpha}]\right]. \tag{11}$$

From (11), recalling that (6) implies $\lim_{\alpha,\gamma\to 1} X = \left(\frac{1}{Gk}\right)$, we have:

$$\lim_{\alpha,\gamma\to 1} \pi = 2 + 2k - [k + kG]\left(\lim_{\alpha,\gamma\to 1} X\right) = (2k+1) - \left(\frac{1}{G}\right). \tag{12}$$

Recalling Proposition 1(ii), part (ii) of Corollary 1 follows from (12) by continuity. •

Proof of Proposition 2. Using (7) and (8), we get:

$$x_c = \frac{\left(\frac{\alpha}{k}\right)(1-\lambda_c)^\alpha \lambda_c}{g_c{}^\gamma}; \tag{13}$$

which, in light of (3), implies:

$$\pi_c = 1 + \left[k - (1-\lambda_c)^\alpha \left(\frac{\alpha \lambda_c}{g_c{}^\gamma} + 1\right)\right]. \tag{14}$$

It follows from (8) and (14) that π_c increases with an increase in *G*, given $\frac{g_M}{g_N}$. Now note that:

$$\frac{\partial \pi_c}{\partial \lambda_c} = -\left(\frac{\alpha}{{g_c}^{\gamma}}\right)(1-\lambda_c)^{\alpha-1}[(1-\lambda_c) - \alpha\lambda_c - {g_c}^{\gamma}] > 0; \tag{15}$$

since $g_c \geq 1$. Let $g_{-c} \equiv \rho G$. Rewriting (8) as: $\lambda_c = \frac{(\rho)^{\frac{\gamma}{\alpha}}}{\left[(\rho)^{\frac{\gamma}{\alpha}} + (1-\rho)^{\frac{\gamma}{\alpha}}\right]}$, we have: $\frac{d\lambda_c}{d\rho} = \frac{\gamma\lambda_c(1-\lambda_c)}{\alpha\rho(1-\rho)}$.

From (14), $\frac{\partial \pi_c}{\partial \rho} = -\left[\ (1-\lambda_c)^{\alpha}\left(\frac{\alpha\gamma\lambda_c}{(1-\rho){g_c}^{\gamma}}\right)\right]$. Thus, using (14)-(15), we have:

$$\frac{d\pi_c}{d\rho} = \frac{\partial \pi_c}{\partial \lambda_c}\left(\frac{d\lambda_c}{d\rho}\right) + \frac{\partial \pi_c}{\partial \rho}$$

$$= -\left(\frac{\gamma}{(1-\rho)\rho {g_c}^{\gamma}}\right)(1-\lambda_c)^{\alpha}\lambda_c\left[(1-{g_c}^{\gamma}) + \rho[\alpha(1-\frac{\lambda_c}{\rho}) - \left(\frac{\lambda_c}{\rho}\right)]\right]. \tag{16}$$

We have $[1-{g_c}^{\gamma}] \leq 0$ since $g_c \geq 1$. By (8), $\frac{\lambda_c}{\rho}$ increases as α increases and decreases as γ increases when $\lambda_c < \frac{1}{2}$, i.e. $\frac{g_c}{g_{-c}} \equiv \frac{1-\rho}{\rho} > 1$ and remains constant if $\frac{g_c}{g_{-c}} = 1$. Hence, given $\frac{g_c}{g_{-c}} \geq 1$, $Z \equiv (1-\frac{\lambda_c}{\rho})$ cannot fall as γ increases, so that $Z \leq \overline{Z} \equiv (1 - \frac{1}{\rho\left[1+\left(\frac{g_c}{g_{-c}}\right)^{\frac{1}{\alpha}}\right]})$. Now, recalling that $\frac{g_c}{g_{-c}} \equiv \frac{1-\rho}{\rho}$, we have $\lim_{\alpha\to 1}\overline{Z} = 0$, so that $\lim_{\alpha\to 1} Z \leq 0$. When $\frac{g_c}{g_{-c}} \geq 1$, Z is non-increasing in α, so that $Z \leq 0$ for all $\alpha > 1$. It follows from (16) that $\frac{d\pi_c}{d\rho} > 0$ if $\frac{g_c}{g_{-c}} \geq 1$. Since a fall in ρ is equivalent to a rise in $\frac{g_c}{g_{-c}}$, the second claim in Proposition 2(i) follows. Now suppose $\frac{g_c}{g_{-c}} < 1$, so that $\rho > \frac{1}{2}$. Recall that $\lim_{\alpha\to 1}\left(\frac{\lambda_c}{\rho}\right) = \frac{1}{\rho\left[1+\left(\frac{1-\rho}{\rho}\right)^{\gamma}\right]}$. Thus, $\lim_{\alpha\to 1}\left(\frac{\lambda_c}{\rho}\right) \in (\frac{1}{2\rho}, 1]$ when $\rho > \frac{1}{2}$. Hence $\lim_{\alpha\to 1}\left[\alpha\left(1-\frac{\lambda_c}{\rho}\right) - \left(\frac{\lambda_c}{\rho}\right)\right] < 1 - \frac{1}{\rho} < 0$ (since $\rho < 1$). Thus, using (16), we have $\lim_{\alpha\to 1}\frac{d\pi_c}{d\rho} > 0$ when $\frac{g_c}{g_{-c}} < 1$. Since $\lim_{\alpha\to\infty}\lambda_c = \frac{1}{2}$, it is evident from (16) that $\lim_{\alpha\to\infty}\frac{d\pi_c}{d\rho} < 0$ when $\rho > \frac{1}{2}$. The third claim in Proposition 2(i) follows by continuity.

Recalling (8), $\frac{\partial \lambda_c}{\partial g_{-c}} > 0$. Part (ii) of Proposition 2 follows from (14)-(15).

Now, from (8),

$$\frac{d\lambda_c}{dg_c} = \frac{-\gamma\left(\frac{g_c}{g_{-c}}\right)^{\frac{\gamma}{\alpha}}}{\alpha g_c\left(1+\left(\frac{g_c}{g_{-c}}\right)^{\frac{\gamma}{\alpha}}\right)^2} = \frac{-\gamma(1-\lambda_c)\lambda_c}{\alpha g_c}. \tag{17}$$

Using (14), (15) and (17), we get:

$$\frac{d\pi_c}{dg_c} = \left(\frac{\gamma}{{g_c}^{\gamma+1}}\right)(1-\lambda_c)^{\alpha}\lambda_c[(1-\lambda_c)(1+\alpha)-{g_c}^{\gamma}]. \tag{18}$$

Using (8),

$$[(1-\lambda_c)(1+\alpha)-{g_c}^{\gamma}] = {g_c}^{\gamma}\left[\frac{(1+\alpha)}{(g_c)^{\gamma\left(\frac{\alpha-1}{\alpha}\right)}\left[(g_c)^{\frac{\gamma}{\alpha}}+(g_{-c})^{\frac{\gamma}{\alpha}}\right]}-1\right].$$

Since $\alpha > 1$, $\left[\frac{(1+\alpha)}{(g_c)^{\gamma\left(\frac{\alpha-1}{\alpha}\right)}\left[(g_c)^{\frac{\gamma}{\alpha}}+(g_{-c})^{\frac{\gamma}{\alpha}}\right]}-1\right] \geq \left[\frac{(1+\alpha)}{2(\overline{g}^{\gamma})}-1\right]$ for $g_c \leq \overline{g}, g_{-c} \leq \overline{g}$. The RHS of this inequality is positive iff $\left[\alpha > 2(\overline{g}^{\gamma})-1\right]$. Furthermore, given any $g_{-c} \geq 1$ and any $g_c > g_{-c}$, $\left[\frac{(1+\alpha)}{2(g_{-c})^{\gamma}}-1\right] > \left[\frac{(1+\alpha)}{(g_c)^{\gamma\left(\frac{\alpha-1}{\alpha}\right)}\left[(g_c)^{\frac{\gamma}{\alpha}}+(g_{-c})^{\frac{\gamma}{\alpha}}\right]}-1\right]$. The LHS is non-positive iff $[\alpha \leq 2({g_{-c}}^{\gamma})-1]$. If $g_c = g_{-c}$, $0 \geq \left[\frac{(1+\alpha)}{2(g_{-c})^{\gamma}}-1\right] = \left[\frac{(1+\alpha)}{(g_c)^{\gamma\left(\frac{\alpha-1}{\alpha}\right)}\left[(g_c)^{\frac{\gamma}{\alpha}}+(g_{-c})^{\frac{\gamma}{\alpha}}\right]}-1\right]$ when $[\alpha \leq 2({g_{-c}}^{\gamma})-1]$. Parts (iii) and (iv) of Proposition 2 follow in light of (18). •

Chapter IV

Liberty and Conflict[20]

4.1. Introduction

Religious norms are often defined as a code of conduct (established as codified laws by the sovereign or as socially agreed tenets). These well-defined norms can influence the behaviour of the society at large as the norms span over varied aspects of individual liberty and behaviour including dresses, food habits (e.g. restrictions on beef, pork or alcohol), sexuality and other gender specific liberties, gay marriage etc. Such standardized laws extend influence on the workplace environment and has ramifications on the workers' decisions. These laws directly influence the (dis) utility faced by individuals and more so in the workplace where the imposed laws have to be adhered to as ordained. Thus, the implications of these laws, for a population divided into secular and religious peoples, is not straight forward as highly restrictive liberty laws, in sync with the religious norms, create a more conducive work environment for the religious people but is simultaneously abhorrent for the secular workers and vice-versa.

In the developed countries[21], the "rights revolution" led to the liberalization of the restrictive laws which culminated in a larger but liberal labour market. But, at the same time, these

[20] This chapter is co-authored with Prof. Indraneel Dasgupta.

[21] Esteban *et al.* (2018, 2019) and Mayoral *et al.* (2019) provide a detailed description of the emergence of liberty and its implications.

changes turned the workplace ambience into a more uncomfortable one for the religious people. This phenomenon clearly affected the labour supply decisions of the individuals as per their inherent religiosity. Secularism has been a long-term phenomenon in the developed countries (Strulik (2016a, 2016b)) and is intertwined with the economic dynamics of these countries. The growing rights movements and secularism in the developing countries currently put them towards similar policy challenges of optimally dealing with these economic changes engendered by the changes in these codified laws on liberty.

Esteban and Ray (2008) and (2011) analyse “ethnic-based public goods”, as pure public goods based on ethnic identities, which can be contested in the form of imposition of certain ethno-religious practices or by the proclamation of majoritarian or secular norms in the society. Clearly, these ethnic identity-based conflicts, e.g. the impositions of certain identity-based norms, mostly mimic a contest over accessing pure public good in the conventional economic parlance but some private benefits can also come out, e.g. in the form of restricted access to certain resources or identity-based job reservations or discriminations with may infuse a little but often negligible degree of rivalry. So, the “notion of group success” forms the pay-off of the ethnic (pure) public goods (Esteban and Ray (2008)). The kind of conflict we analyse here, regarding the contest over the society-wide norms between the religious and the liberal or secular group, is a case of conflict over “ethnic public good”. Ethnic conflicts on goods of more private nature, e.g. a contest over a mining or oil field, are also intriguing but beyond our immediate research inquiry.

In the recent years, the conflict over dominating the public sphere between the religious and secular groups in terms public demonstration, lobbying and violent skirmishes stand testimony to the growing tensions between the secular and religious groups over dominating the public sphere. In the recent years, the murders and attempts to murder secular bloggers in Bangladesh capture the extreme form of conflict between the secular and religious groups over the public sphere, perceived as a contestable public good. These attacks on the secular activists is also commonplace in other countries and in some cases the countries themselves (especially in the Muslim world) have codified laws of apostasy and blasphemy in place to stem the secular activities in the public. Although the secular (religious) group can get affected badly by both the state imposed restrictive (liberal) laws as well as due to the wasteful conflict over the public sphere, the two channels are different. The state-imposed laws exogenously come from the sovereign, but the conflict over the contestable public sphere pans out endogenously as per the incentives of the secular and religious people. Thus, the state laws act as strategic variable at disposal of the sovereign through which it can influence the effort allocated to conflict over the public sphere and the effort used up in wage earning activity for consumption. Our endeavour is to dig deeper into the economic implications of conflict and production decisions of the religious and secular individuals under different provisions of liberty.

Our modelling exercise analyses a conflict between religious and secular people over contestable public sphere. We consider two groups (Secular and Religious) coexist with conflicting identities and views regarding religious norms. The existing laws on liberty in the workplace are determined by the policy-maker. The policy-maker promulgates legal norms on liberty and rights (or restrict it further) in the work place which applies to the whole labour market that consists of people from the two groups in the workplace. Clearly the imposed liberty laws have opposite external effects on the disutility of labour of the two groups.

Clearly, the more restrictive laws engender lesser disutility of labour for the religious people due to a more amenable work environment whereas the disutility of labour intensifies for the secular people due to the stress of fitting into that environment and vice-versa. The individuals allocate their effort either to the conflict over dominating the public sphere or to wage–earning activities and the residual amount goes to leisure. In this set-up, we analyse the economic implications of different levels of liberty decided by the state.

Interestingly, we find that the conflict expenditures are maximum at the middle zone of the range of the extent of liberty and rights protection and the extreme cases of highly restrictive or fully liberal laws on individual liberty lead to lower value of rent seeking. This takes the policy-maker to the dilemma coming out of the fact that policy stance of highly biased (fully religious or fully liberal laws) religious laws lead to minimal conflict whereas more conciliatory policy stance between the two groups leads to maximal conflict. With sufficiently large group sizes, the next intriguing result follows that the conflict efforts and productive efforts of a group move in the same direction over a certain range of implemented liberal laws. This result stands in contrast with the existing literature where conflict effort and productive effort move in opposite direction and this counterintuitive result is driven by the inclusion of leisure in our model. The dynamics between inequality and aggregate conflict effort also turns out to be non-linear. In the presence of sufficiently large group sizes with limited disparity between group sizes, the aggregate output reaches a minimum in an intermediate zone of liberty and rights laws and the maximum output is ensured at the extreme stance of law being in complete sync with the larger group. This incentivizes the policy-maker, following the objective of maximizing social output, to impose the draconian religious diktats when the religious group is the majority even if the concerned policy-maker is unbiased otherwise.

In Section 4.2 we formalize the model, in section 4.3 we provide the comparative statics and the central propositions of the paper, in section 4.4 we chart out the variants and extensions and in section 4.5 we conclude.

4.2. The model

Consider a society consisting of two groups, secular (S) and religious (R). Total population of the society is n, of whom population size of n_S belong to group S and n_R belong to group R .

The number of individuals belonging to group $j \in \{S, R\}$ is n_j; $n_R + n_S = n$. Each individual is endowed with 1 unit of time, which she has to allocate among three possible uses: productive labour (l_{pi}^{j}) at wage rate w to earn income for private consumption, contestation with (i.e., rent-seeking against) the other community for inter-group division of a given amount of a (group-specific) public good (l_{ei}^{j}) and consumption as leisure $(1 - l_{pi}^{j} - l_{ei}^{j})$; with $j \in \{S, R\}$ denoting the individual's group and $i \in \{1,2, \dots, n_j\}$ denoting the individual. Preferences of individual i in group j are specified as follows[22]:

$$u_{ij} = w\ l_{pi}^{j} + P_j Y - \delta\left(\left(1 + g_j B\right)\ l_{pi}^{j} + l_{ei}^{j}\right)^{\alpha}\ ; \tag{1}$$

where P_j is the proportion of the public good accruing to the individual's own group, Y is the amount of the public good, $\delta > 0$, and $\alpha \geq \underline{\alpha} > 1$. Parameter α represents the degree of marginal disutility of labour and its value is greater than one, which follows from increasing marginal disutility of labour. The preference parameter g_j takes the value -1 if the individual

[22] The pay-off function is related to some extent to both the "rent-seeking model" and "production and conflict model" of Hausken (2005). In terms of the rent-seeking effort expended on ethnic public good, the pay-off function is related to a "rent-seeking model" whereas the explicit inclusion of productive efforts makes it loosely related to the "production and conflict model" as well but the productive effort is not directly linked to the ethnic public good. It is linked through the disutility of labour term. The rent-seeking effort component of the pay-off function is also somewhat similar to the pay-off function formulation of Cheikboosian and Fayat (2018) but fundamentally different due to the inclusion of the productive effort and labour-leisure framework. A novelty lies in including both the rent-seeking and productive efforts into the convex disutility of labour term, which can capture the substitution effect between the two kinds of efforts better than an additively separable utility function. Also, the channel through which the extant norms in the public sphere affect the marginal disutility of labour in the work-place, which are not usually reflected properly in the standard models of ethnic conflict, is precisely delineated through the disutility of labour term in the pay-off.

belongs to the group *S*, and 1 if she belongs to the group *R*. *B* is a policy parameter which measures the extent to which laws and regulations governing workplace behaviour and interaction reflect the values and norms of one group rather than the other; $B \in [-\frac{1}{2}, \frac{1}{2}]$. A higher value of *B* implies that workplace laws and regulations reflect the values and norms of *S*, rather than *R*, more closely. Consequently, a given allocation of labour to productive activities generates less disutility for an *S* individual, holding her leisure consumption invariant. The exact opposite holds for an *R* individual. Each group's share of the public good is given by the standard Tullock contest success function:

$$P_j = \left(\frac{\sum_{i=1}^{n_j} l_{ei}^j}{\sum_{i=1}^{n_S} l_{ei}^S + \sum_{i=1}^{n_R} l_{ei}^R}\right) \text{ if } \left(\sum_{i=1}^{n_S} l_{ei}^S + \sum_{i=1}^{n_R} l_{ei}^R\right) > 0;$$

$$P_j = \left(\frac{1}{2}\right) \text{ otherwise.} \tag{2}$$

All individuals choose their effort allocations simultaneously, so as to maximize their preferences as specified in (1), subject to the contest success function (2) and the time constraint $0 \leq \left(l_{ei}^j + l_{pi}^j\right) \leq 1$; as well as the non-negativity constraints $l_{ei}^j, l_{pi}^j \geq 0$.

Using (1) and (2), we get:

$$\frac{\partial u_{iR}}{\partial l_{pi}^R} = w - \alpha\delta\left((1+B)\, l_{pi}^R + l_{ei}^R\right)^{\alpha-1}(1+B); \tag{3}$$

$$\frac{\partial u_{iS}}{\partial l_{pi}^S} = w - \alpha\delta\left((1-B) l_{pi}^S + l_{ei}^S\right)^{\alpha-1}(1-B); \tag{4}$$

$$\frac{\partial u_{iR}}{\partial l_{ei}^R} = \left(\frac{\sum_{i=1}^{n_S} l_{ei}^S}{\left(\sum_{i=1}^{n_S} l_{ei}^S + \sum_{i=1}^{n_R} l_{ei}^R\right)^2}\right) Y - \alpha\delta\left((1+B)\, l_{pi}^R + l_{ei}^R\right)^{\alpha-1}; \tag{5}$$

$$\frac{\partial u_{iS}}{\partial l_{ei}^S} = \left(\frac{\sum_{i=1}^{n_R} l_{ei}^R}{\left(\sum_{i=1}^{n_S} l_{ei}^S + \sum_{i=1}^{n_R} l_{ei}^R\right)^2}\right) Y - \alpha\delta\left((1-B) l_{pi}^S + l_{ei}^S\right)^{\alpha-1}. \tag{6}$$

We shall first solve the model assuming an interior solution. We shall subsequently identify the parametric restrictions which ensure an interior solution.

Assuming an interior solution, denoting total rent-seeking allocation $(\sum_{i=1}^{n_S} l_{ei}^S + \sum_{i=1}^{n_R} l_{ei}^R)$ by E, the rent-seeking allocation of group j; $(\sum_{i=1}^{n_j} l_{ei}^j)$ by E_j, and using (3) and (5), we get:

$$\left(\frac{E_S}{E^2}\right) Y = \frac{w}{1+B}; \tag{7}$$

which yields:

$$E_S = \left(\frac{w}{1+B}\right) \left(\frac{1}{Y}\right) E^2. \tag{8}$$

Similarly, by (4) and (6),

$$E_R = \left(\frac{w}{1-B}\right) \left(\frac{1}{Y}\right) E^2. \tag{9}$$

Together, (8) and (9) yield:

$$E = \left(\frac{Y}{2w}\right)(1 - B^2). \tag{10}$$

From (8) and (10) we get:

$$E_S = \left(\frac{1}{1+B}\right) \left(\frac{Y}{4w}\right)(1 - B^2)^2; \tag{11}$$

while (9) and (10) yield:

$$E_R = \left(\frac{1}{1-B}\right) \left(\frac{Y}{4w}\right)(1 - B^2)^2. \tag{12}$$

Evidently, E, E_S, E_R are all positive for any value of B. Recalling (2), (10) and (11) yield the equilibrium group shares:

$$P_S = \frac{(1-B)}{2}, P_R = \frac{(1+B)}{2}. \tag{13}$$

From (11) and (12), we also get, respectively,

$$\frac{dE_S}{dB} = -\left(\frac{Y}{4w}\right)(1-B)\,(1+3B); \tag{14}$$

$$\frac{dE_R}{dB} = \left(\frac{Y}{4w}\right)(1+B)\,(1-3B). \tag{15}$$

Now, using (3), we get:

$$l_{pi}^R = \left(\frac{1}{1+B}\right)^{\frac{\alpha}{\alpha-1}}\left(\frac{w}{\alpha\delta}\right)^{\frac{1}{\alpha-1}} - \frac{l_{ei}^R}{(1+B)} \tag{16}$$

Letting $F_R \equiv n_R l_{pi}^R$ denote total productive effort by group *R*, we have from (16):

$$F_R = n_R\left(\frac{1}{1+B}\right)^{\frac{\alpha}{\alpha-1}}\left(\frac{w}{\alpha\delta}\right)^{\frac{1}{\alpha-1}} - \frac{E_R}{(1+B)}. \tag{17}$$

In light of (12), (17) implies:

$$F_R = n_R\left(\frac{1}{1+B}\right)^{\frac{\alpha}{\alpha-1}}\left(\frac{w}{\alpha\delta}\right)^{\frac{1}{\alpha-1}} - \left(\frac{Y}{4w}\right)(1-B^2). \tag{18}$$

From (18),

$$\frac{dF_R}{dB} = \left(\frac{YB}{2w}\right) - n_R\left(\frac{\alpha}{\alpha-1}\right)\left(\frac{1}{1+B}\right)^{\frac{2\alpha-1}{\alpha-1}}\left(\frac{w}{\alpha\delta}\right)^{\frac{1}{\alpha-1}}. \tag{19}$$

Notice that $F_R > 0$, and $\frac{dF_R}{dB} < 0$, regardless of the value of *B*, if n_R is sufficiently high. Now, from (17), total effort provided by *R* can be derived as follows:

$$F_R + E_R = n_R\left(\frac{1}{1+B}\right)^{\frac{\alpha}{\alpha-1}}\left(\frac{w}{\alpha\delta}\right)^{\frac{1}{\alpha-1}} + E_R\left(\frac{B}{1+B}\right)$$

$$= n_R\left(\frac{1}{1+B}\right)^{\frac{\alpha}{\alpha-1}}\left(\frac{w}{\alpha\delta}\right)^{\frac{1}{\alpha-1}} + B(1-B^2)\left(\frac{Y}{4w}\right). \tag{20}$$

Analogously, using (4),

$$F_S = n_S\left(\frac{w}{\alpha\delta}\right)^{\frac{1}{\alpha-1}}\left(\frac{1}{1-B}\right)^{\frac{\alpha}{\alpha-1}} - (1-B^2)\left(\frac{Y}{4w}\right); \tag{21}$$

$$\frac{dF_S}{dB} = \left(\frac{YB}{2w}\right) + n_S\left(\frac{\alpha}{\alpha-1}\right)\left(\frac{1}{1-B}\right)^{\frac{2\alpha-1}{\alpha-1}}\left(\frac{w}{\alpha\delta}\right)^{\frac{1}{\alpha-1}}; \tag{22}$$

$$F_S + E_S = n_S\left(\frac{1}{1-B}\right)^{\frac{\alpha}{\alpha-1}}\left(\frac{w}{\alpha\delta}\right)^{\frac{1}{\alpha-1}} - B(1-B^2)\left(\frac{Y}{4w}\right)$$

$$= n_R\left(\frac{1}{1+B}\right)^{\frac{\alpha}{\alpha-1}}\left(\frac{w}{\alpha\delta}\right)^{\frac{1}{\alpha-1}} + B(1-B^2)\left(\frac{Y}{4w}\right). \tag{23}$$

Recall that $\alpha \geq \underline{\alpha}$. We assume the following.

Assumption A1. $\left(\frac{2^{\underline{\alpha}}w}{\alpha\delta}\right) < 1$.

Assumption A1 ensures interior solutions for sufficiently large groups. More formally, we have the following Lemma, which follows directly from (18)-(23).

Lemma 1. (i) Given A1, there exists $\underline{n_R} > 0$ such that, for all $B \in \left[-\frac{1}{2},\frac{1}{2}\right]$, and for every $n_R > \underline{n_R}$: (i) $F_R, E_R > 0$, (ii) $[0 < F_R + E_R < n_R]$, and (iii) $\frac{dF_R}{dB} < 0$.

(ii) Given A1, there exists $\underline{n_S} > 0$ such that, for all $B \in \left[-\frac{1}{2},\frac{1}{2}\right]$, and for every $n_S > \underline{n_S}$: (i) $F_S, E_S > 0$, (ii) $[0 < F_S + E_S < n_S]$, and (iii) $\frac{dF_S}{dB} > 0$.

By Lemma 1, productive labour supplied by either group monotonically increases as the workplace norms move closer to its values.

Now, from (18) and (21), aggregate productive effort is given by:

$$F \equiv F_S + F_R = \left(\frac{w}{\alpha\delta}\right)^{\frac{1}{\alpha-1}}\left[n_S\left(\frac{1}{1-B}\right)^{\frac{\alpha}{\alpha-1}} + n_R\left(\frac{1}{1+B}\right)^{\frac{\alpha}{\alpha-1}}\right] - (1-B^2)\left(\frac{Y}{2w}\right). \tag{24}$$

From (24),

$$\frac{dF}{dB} = \left(\frac{w}{\alpha\delta}\right)^{\frac{1}{\alpha-1}}\left(\frac{\alpha}{\alpha-1}\right)\left[n_S\left(\frac{1}{1-B}\right)^{\frac{2\alpha-1}{\alpha-1}} - n_R\left(\frac{1}{1+B}\right)^{\frac{2\alpha-1}{\alpha-1}}\right] + \left(\frac{YB}{2w}\right); \tag{25}$$

and

$$\frac{d^2F}{dB^2} > 0. \tag{26}$$

Consider the term $G \equiv \left[n_S\left(\frac{1}{1-B}\right)^{\frac{2\alpha-1}{\alpha-1}} - n_R\left(\frac{1}{1+B}\right)^{\frac{2\alpha-1}{\alpha-1}}\right]$. At $B = -\frac{1}{2}$, $G = \left(\frac{2}{3}\right)^{\frac{2\alpha-1}{\alpha-1}}\left[n_S - n_R(3)^{\frac{2\alpha-1}{\alpha-1}}\right]$; at $B = \frac{1}{2}$, $G = \left(\frac{2}{3}\right)^{\frac{2\alpha-1}{\alpha-1}}\left[n_S(3)^{\frac{2\alpha-1}{\alpha-1}} - n_R\right]$. Since $\alpha > 1$, $\left(\frac{2\alpha-1}{\alpha-1} > 2\right)$, we have:

$$\text{at } B = -\frac{1}{2}, \frac{dG}{dB} < 0 \text{ if } \left(n_S < 9n_R\right); \text{at } B = \frac{1}{2}, \frac{dG}{dB} > 0 \text{ if } \left(n_S > \frac{n_R}{9}\right). \tag{27}$$

4.3. Comparative statics

We are now ready to address the question of how conflict and output in our society respond to changes in workplace regulations in favour of either group.

Our first set of results, which follow immediately from (10)-(15) and Lemma 1 characterize the behaviour of rent-seeking effort.

Proposition 1. Let A1 hold.

(i) Aggregate labour allocated to rent-seeking first increases, and subsequently declines, as B increases over $\left[-\frac{1}{2},\frac{1}{2}\right]$, reaching its maximum value of $\left(\frac{Y}{2w}\right)$ at $B = 0$, and minimum value of $\left(\frac{3Y}{8w}\right)$ at both $B = -\frac{1}{2}$ and $B = \frac{1}{2}$.

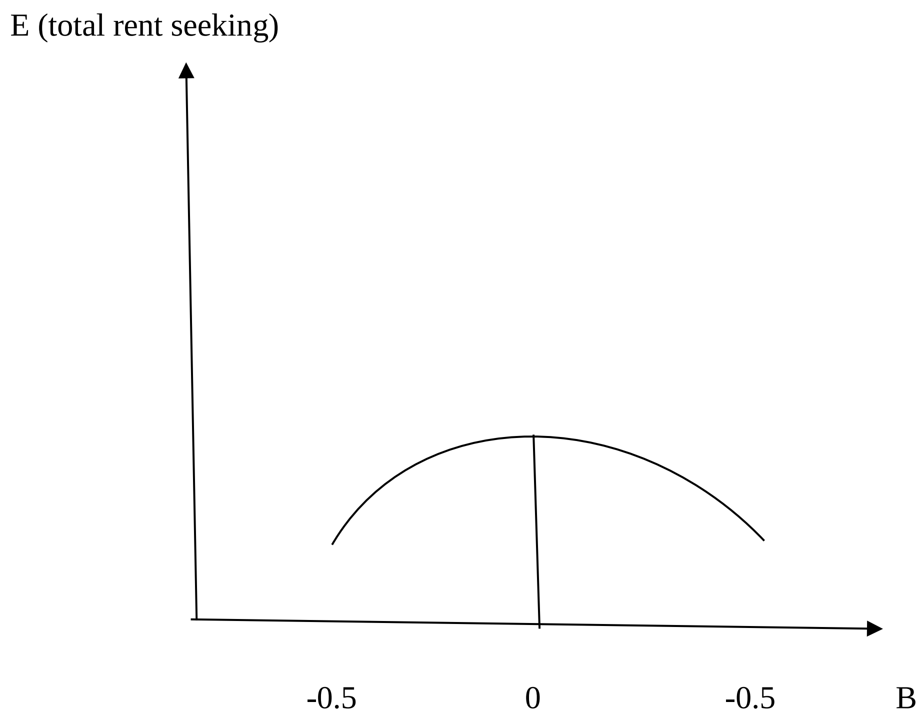
(ii) Labour allocated to rent-seeking by group S first increases, and subsequently declines, as B increases over $\left[-\frac{1}{2},\frac{1}{2}\right]$, reaching its maximum value of $\left(\frac{8Y}{27w}\right)$ at $B = -\frac{1}{3}$, and minimum value of $\left(\frac{3Y}{32w}\right)$ at $B = \frac{1}{2}$.

(iii) Labour allocated to rent-seeking by group R first increases, and subsequently declines, as B increases over $\left[-\frac{1}{2},\frac{1}{2}\right]$, reaching its maximum value of $\left(\frac{8Y}{27w}\right)$ at $B = \frac{1}{3}$, and minimum value of $\left(\frac{3Y}{32w}\right)$ at $B = -\frac{1}{2}$.

(iv) Each group's share varies over the interval $\left[\frac{1}{4},\frac{3}{4}\right]$, with P_S declining monotonically in B.

The striking aspect of Proposition 1(i) is that the magnitude of aggregate conflict and its response to changes in the workplace regulation parameter B are both independent of the population shares of the two groups. Exact neutrality between the two groups ($B = 0$) generates the maximum conflict, while maximum possible partisanship $B = -\frac{1}{2}$ or $B = \frac{1}{2}$ both minimize social conflict. Thus, if social policy prioritizes social peace over all other objectives, Proposition 1(i) implies that this may be best achieved by enforcing workplace norms that prioritize the values of any one group to the maximum extent possible. As workplace norms move closer to the preferences of either group, its allocation of rent-seeking effort first increases, and, beyond a threshold, falls (Proposition 1(ii) and Proposition 1(iii)). Proposition 1(iv) implies that the closer the workplace laws are to a group's norms, the worse that group fares in the rent-seeking contest. This case is depicted in Figure 1 in the next page.

Figure 1 Total conflict efforts



Since the conflict happens over a contestable public good, higher (lower) group size leads to higher (lower) free-riding and thus conflict in the margin remains invariant to group size. But the extant norms directly affect the individual level of (dis)utility and thus norms deviating from the group preferences usher higher conflict efforts. However, this effort comes at the cost of forgoing consumption and leisure and thus the group effort starts to decline as the norms move much closer to its preferences due to increased opportunity cost in terms of foregoing consumption and leisure. Making work culture sufficiently favourable for one group apparently lowers that group's incentive for putting high effort in rent-seeking conflict. Consequently, the other group's equilibrium rent-seeking effort also changes, but changes in such a way that, under a sufficiently biased policy stance, in the aggregate the total rent-seeking effort in the economy falls as well.

In standard models, where an exogenous labour endowment is allocated between production and rent-seeking, any increase in rent-seeking effort must be associated with a commensurate decrease in productive effort. The next issue we investigate is whether this conclusion is robust to the inclusion of leisure, i.e., to the endogenization of labour supply. Lemma 1 and Proposition 1 directly yield the following conclusions.

Proposition 2. Let A1 hold. Then:

(i) there exists $\underline{n_S} > 0$ such that, every $n_S > \underline{n_S}$: labour allocated to rent-seeking and that to production by group *S both* increase as *B* increases over $\left[-\frac{1}{2}, -\frac{1}{3}\right]$,

(ii) there exists $\underline{n_R} > 0$ such that, every $n_R > \underline{n_R}$: labour allocated to rent-seeking and that to production by group *R both* decrease as *B* increases over $\left[\frac{1}{3}, \frac{1}{2}\right]$, and

(iii) there exists $\underline{n} > 0$ such that, whenever $n_S, n_R > \underline{n}$, the share of group S in productive labour $\left(\frac{F_S}{F_S+F_R}\right)$ increases monotonically as *B* increases over $\left[-\frac{1}{2}, \frac{1}{2}\right]$.

Parts (i) and (ii) of Proposition 2 highlight the consequences of endogenizing aggregate labour supply decisions in our model. There exist zones where productive and rent-seeking labour allocations move in tandem in response to changes in workplace regulations, leading to corresponding changes in leisure consumption. Part (iii) of Proposition 2 shows that wage share of either group increases monotonically as workplace regulations move closer to its own norms. Together, Proposition 1(i) and Proposition 2(iii) imply a non-monotone association between income inequality and social conflict – a result derived in a very different context by Dutta *et al.* (2014).

The econometric research on the relationship between religiosity and income[23], also needs to factor in that in the presence of a contestable public sphere the linkages are not straight forward as evident from the above proposition. The role of the existing religious laws in the workplace need to be reckoned with due to its non-trivial relationship with the realized conflict expenditure and inequality to get a holistic understanding of the outcomes.

Finally, we turn to the behaviour of aggregate productive effort – a proxy for total social output. Together, (24)-(27) immediately yield the following.

Proposition 3. Let A1 hold, and suppose $\left[\frac{n_R}{9} < n_S < 9n_R\right]$. Then there exists $\underline{n} > 0$ such that, whenever $n_S, n_R > \underline{n}$:

(i) aggregate productive effort, F, initially declines, and subsequently rises, in B over $\left[-\frac{1}{2}, \frac{1}{2}\right]$, reaching its unique minimum at $\tilde{B} \in (-\frac{1}{2}, \frac{1}{2})$;

(ii) $\tilde{B} >$ (resp. <) 0 if $n_S <$ (resp. >) n_R;

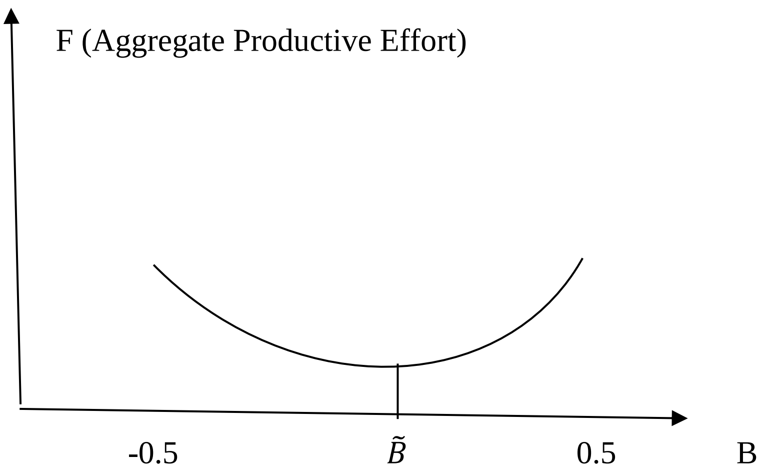
(iii) $|\tilde{B}|$ increases as w increases;

(iv) F is maximized at $B = \frac{1}{2}$ (resp. $-\frac{1}{2}$) if $n_S > n_R$ (resp. $< n_R$).

[23] Herzer *et al*. (2017) find a negative relation between religiosity and income in a cross-country study.

The dynamics of aggregate productive effort is depicted in Figure 2 below.

Figure 2: Aggregate Productive Effort.



By Proposition 3(i), aggregate productive effort (and thus, social output) is minimized when social policy is somewhat biased in favour of the group which constitutes the minority. By Proposition 3(ii), given unequal-sized groups, there always exists a range of values of *B*, where conflict and output move *together* as *B* changes, instead of moving in opposite directions, as might be intuitively expected (and must happen in a model without leisure). When the *S* group constitutes the minority, there exists a range, $(0, \tilde{B})$, over which conflict and output both fall – implying that aggregate consumption of leisure rises - as *B* increases. Conversely, when the *S* group constitutes the majority, there exists a range, $(\tilde{B}, 0)$, over which conflict and output both increase – implying that aggregate consumption of leisure falls - as *B* increases. Thus, in either case, as social policy moves marginally in favor of the minority from an initial situation of exact neutrality, conflict and output both fall – so that aggregate consumption of leisure increases in the society. By Proposition 3(iii), the higher the wage rate, the larger the range over which conflict and output move together in response to a change in workplace regulations. By Proposition 3(iv), aggregate social output is uniquely maximized by bringing workplace behavioural regulations into maximum possible alignment with the values and norms of the majority community.

4.4. Variants and extensions

4.4.1. Conflict over impure public good

The results and the policy implications hold true even if we consider the public sphere as an impure public good where the extent of rivalry is sufficiently small. This usually signifies a conflict over dominating public sphere in terms of ethno-religious identity-based dominance but can also come with some personal pecuniary benefits (e.g., through expropriation, job reservation and discrimination). Following Cheikbossian and Fayat (2018), for a member i of group j , if we replace the realized value of the public sphere in case of win as $\frac{Y}{n_j^{\beta}}$ (where $\beta = 0$, for a pure public good as in our model) the pay-off function in (1) gets modified as follows;

$$u_{ij} = w\ l_{pi}^{j} + P_j \frac{Y}{n_j^{\beta}} - \delta\left(\left(1 + g_j B\right)\ l_{pi}^{j} + \ l_{ei}^{j}\ \right)^{\alpha}\ ; \tag{28}$$

It is straight-forward to prove that there exists a very low value of β say $\bar{\bar{\beta}}$, such that for $\beta \in (0, \bar{\bar{\beta}})$; all the policy implications as derived under a pure public good hold true in this context. Thus, the findings are robust to a more general class of models when the "private-ness" of the ethnic public goof is sufficiently low.

4.4.2. Moderate group

Along with the two groups under consideration, there might exist a moderate group (e.g., a group of immigrant workers who are completely aloof to the conflicting identities of the religious and the secular or liberal group). The utility of member i of this group, say M, is as follows:

$$u_{iM} = w\ l_{pi}^{M} + P_M Y_M - \delta\left(\ l_{pi}^{j} + \ l_{ei}^{j}\ \right)^{\alpha} \tag{29}$$

where, Y_M is the valuation of the contested part of the public sphere by the members of the group. The identity factor does not have any role to play as the members either perceive the whole public sphere as non-contested or the valuation of the contested part is zero to them. Thus, the value of the contested public sphere is zero for moderate group members (i.e., $Y_M = 0$). Thus, such a group member only expends productive labour and does not resort to rent-seeking activities in the equilibrium. Thus, the presence of such moderate group(s) do not perturb the fundamental policy implications of the main model we studied, since the role of the moderates remain effectively exogenous to the interaction between the two conflicting groups due to the invariance of the moderates to the conflicting identities.

4.4.3. Different wages

In our stripped-down model, we focus on the implications of liberty norms on a society marked by inherently formed identity-based preferences which are sensitive to the extent of provisions for liberties. Thus, we do not go into the policy implications of wage distribution in the main analysis.

Suppose that wage is different between the groups, i.e., say wage in group R is w_R and that in in group S is w_S. In our stripped down approach we have w_R and w_S as equal to w. Clearly, all the policy insights , gained in our model, hold as long as w_R and w_S are sufficiently close to each other. We briefly note down the main takeaways of the model with group-specific wage-earning capacities.

For, $w_R \neq w_s$, it follows similarly to the uniform wage model;

$$E = \frac{Y}{\frac{w_R}{1+B}+\frac{w_S}{1-B}}. \tag{30}$$

$$E_S = \frac{1}{\left(\sqrt{(w_R(1-B))}+\frac{w_S(1+B)}{\sqrt{(w_R(1-B))}}\right)^2} Y(1-B^2)\,. \tag{31}$$

$$E_R = \frac{1}{\left(\sqrt{(w_S(1+B))}+\frac{w_R(1-B)}{\sqrt{(w_S(1+B))}}\right)^2} Y(1-B^2)\,. \tag{32}$$

$$P_S = \frac{w_R(1-B)}{w_R(1-B)+w_s(1+B)}, P_R = \frac{w_s(1+B)}{w_R(1-B)+w_s(1+B)}. \tag{33}$$

The aggregate conflict effort in (30) clearly falls if anyone of the group's wage rises which implies that the rise in the opportunity cost of foregoing productive labour brings down the aggregate conflict efforts. The group-specific conflict efforts as in (31) and (32) monotonically fall in response to a rise in the wage level of the own group, due to the rise in the opportunity cost of foregoing productive effort. The relationship of the group's conflict effort with the other group's wage is non-linear since too low wage of the other group causes it to put too high effort in conflicts thus incentivizing the own group to focus more on production whereas a too high wage of the opponent incentivizes the opponent to put too low effort in conflict thus drawing down the conflict efforts of the own group as the marginal gain of own group members from conflict becomes too high, given that the interior solution exists.

Unlike the uniform wage model, the shares of the public good in (33) is explicitly wage-dependent in the equilibrium. The rise in the own group's wage level firms up the productive efforts and thus brings down the conflict efforts and thus the share of the public good falls for the own group members whereas a rise in the rival group's wage has the opposite effect as the rival group-members becomes more focused towards productive activities.

4.4.4. Taxation

An alternative policy intervention can be engendered in the form of group specific taxes on the wages. For a member i in group j, with tax imposed at the rate t_j; the modified utility function follows from (1) as;

$$u_{ij} = w\left(1 - t_j\right)\ l_{pi}^{j} + P_j Y - \ \delta\left(\left(1 + g_j B\right)\ \ l_{pi}^{j} + \ l_{ei}^{j}\ \right)^{\alpha}\ ; \tag{34}$$

Identity based taxation faces an implementational challenge by its nature. Designing a transfer policy based on that can be further impracticable. From (34) it clearly follows that a rise in the tax rate on any group, without a clearly designed transfer policy, raises the aggregate conflict efforts (this follows from a similar argument as in (30)). Thus, taxation as policy option can do more harm than good in this context and does not look like a viable policy option.

4.5. Concluding remarks

The simple modelling exercise on the role of state-imposed laws of individual rights and liberty provides a new acumen into the challenging and counter-intuitive policy implications of conflict and output both at group and economy wide level. The observed persistence of the state imposed religious laws that impinges on the domains of rights and liberty on the face of growing secularism and rights movements can be explained through the model here, as it captures the multiple policy dilemmas faced by the policy-maker. A benevolent policy maker with the goal of maximizing output or minimizing conflict expenditure can possibly end up with the situation of imposition of a slightly more secular law leading to possible escalation in conflict and reduction in output. Similarly, a policymaker trying to re-impose more religious norms can usher same kind of challenges like lower output and higher conflict. At the group level the model shows that the movement of conflict efforts and productive effort is also not straightforward and in certain stretches the efforts can move in the same direction, thus making the policy exercise more challenging when it factors in the group level effects along with the economy wide considerations with respect to the imposed laws. Also, inequality and conflict efforts turn out to have a non-linear relationship, thus depriving the policy-maker the option to address both with a single economic tool. Economically desirable outcomes of minimizing conflict and maximizing social output are reached either under the extreme form of religious laws or fully secular laws whereas the reconciliatory policy stances turn out to be welfare reducing.

One of the interesting future avenues to pursue is in dealing with conflicts over publicly provided private goods which have been studied recently by Sen (2018). Incorporating such conflicts in our framework may yield useful insights.

Another interesting domain is the consideration of more than one competing religions, where the secular sub-groups of the religious groups can develop certain synergy or antagonisms within themselves on the face of different kinds of restrictive religious laws.

Bibliography

Alesina, A., Baqir, R., & Easterly, W. (1999). Public goods and ethnic divisions. *Quarterly Journal of Economics*, *114*, 1243–1284.

Armstrong, A. (2015): Equilibria and efficiency in bilingual labor markets, *Journal of Economic Behavior & Organization*, 112: 204-220.

Austen-Smith, D., and Fryer, R.G. Jr. (2005): An economic analysis of 'acting White', *Quarterly Journal of Economics* 120(2): 551-583.

Baik, K. H. (2008). Contests with group-specific public-good prizes. *Social Choice and Welfare*, *30,* 103-117.

Bergstrom, T. C., Blume, L., & Varian, H. (1986). On the private provision of public goods. *Journal of Public Economics*, *29,* 25–49.

Cheikbossian, G. (2008). Heterogeneous groups and rent-seeking for public goods. *European Journal of Political Economy*, *24,* 133–150.

Cheikbossian, G., & Fayat, R. (2018). Group size, collective action and complementarities in efforts. *Economics Letters, 168,* 77-81.

Choi, J. P., Chowdhury, S. M., & Kim, J. (2016). Group contests with internal conflict and power asymmetry. *Scandinavian Journal of Economics*, *118,* 816–840.

Chowdhury, S. M., Lee, D., & Sheremeta, R. (2013). Top guns may not fire: Best-shot group contests with group-specific public good prizes. *Journal of Economic Behavior and Organization*, *92*, 94-103.

Church, J., and King, I. (1993): Bilingualism and network externalities, *Canadian Journal of Economics 26*: 337–345.

Dasgupta, I., & Kanbur, R. (2005a). Community and anti-poverty targeting. *Journal of Economic Inequality*, *3*, 281-302.

Dasgupta, I., & Kanbur, R. (2005b). Bridging communal divides: separation, patronage, integration. In C. Barrett (Ed.), *The social economics of poverty: On identities, groups, communities and networks*, 146-170. London: Routledge.

Dasgupta, I., & Kanbur, R. (2007). Community and class antagonism. *Journal of Public Economics, 91*, 1816-1842.

Dasgupta, I. (2009). 'Living' wage, class conflict and ethnic strife. *Journal of Economic Behavior and Organization*, *72*, 750-765.

Dasgupta, I., & Kanbur, R. (2011). Does philanthropy reduce inequality? *Journal of Economic Inequality*, *9*, 1-21.

Dasgupta, I. (2017): Linguistic assimilation and ethno-religious conflict, in W. Buchholtz and D. Ruebbelke (eds.) *The Theory of Externalities and Public Goods: Essays in Memory of Richard C. Cornes*; Berlin, Springer: 219-242.

Dutta, I., P. Madden and A. Mishra (2014): "Group inequality and conflict", *The Manchester School* 82 (3): 257-283.

Egger, P., and Toubal, F. (2016): Common spoken languages and international trade, in V. Ginsburgh and S. Weber (eds.) *The Palgrave Handbook of Economics and Language*; New York, Palgrave Macmillan: 263-289.

Epstein, G. S., & Mealem, Y. (2009). Group specific public goods, orchestration of interest groups with free riding. *Public Choice*, *139*, 357–369.

Esteban, J., & Ray, D. (2001). Collective action and the group size paradox. *American Political Science Review*, *95*, 663–672.

Esteban, J., & Ray, D. (2008). On the salience of ethnic conflict. *American Economic Review, 98(5),* 2185-2202.

Esteban, J., & Ray, D. (2011). A model of ethnic conflict. *Journal of the European Economic Association*, *9*, 496–521.

Esteban, J., Levy, G., & Mayoral, L. (2018). Liberté, égalité… religiosité. *Journal of Public Economics*, *164*, 241-253.

Esteban, J., Levy, G., & Mayoral, L. (2019). Personal liberties, religiosity, and effort. *European Economic Review*, *120*, 103320.

Gabszewicz, J., Ginsburgh, V., and Weber, S. (2011): Bilingualism and communicative benefits, *Annals of. Economics and. Statistics*, 101-2, 271–286.

Ginsburgh, V., and Weber, S. (eds.) (2016): *The Palgrave Handbook of Economics and Language*; New York, Palgrave Macmillan.

Gradstein, M. (1993). Rent-seeking and the provision of public goods. *Economic Journal*, *103*, 1236–1243.

Hausken, K. (2005). Production and conflict models versus rent-seeking models. *Public Choice*, *123*, 59-93.

Herzer, D., & Strulik, H. (2017). Religiosity and income: A panel cointegration and causality analysis. *Applied Economics*, *49*(30), 2922-2938.

Kamwangamalu, N.M. (2016): *Language Policy and Economics: The Language Question in Africa*; New York, Palgrave Macmillan.

Katz, E., Nitzan, J., & Rosenberg, S. (1990). Rent-seeking for pure public goods. *Public Choice*, *65*, 49–60.

Kolmar, M., & Rommeswinkel, H. (2013). Contests with group-specific public goods and complementarities in efforts. *Journal of Economic Behavior and Organization*, *89*, 9-22.

Lazear, E. (1999): Culture and language, *Journal of Political Economy* 107(6): S95-S126.

Lee, D. (2012). Weakest-link contests with group-specific public good prizes. *European Journal of Political Economy*, *28*, 238-248.

Lin, A., and Martin, P. (eds.) (2005): *Decolonisation, Globalization: Language-in-education Policy and Practice*; Clevedon, UK, Multilingual Matters.

Mayoral, L., & Esteban, J. (2019). Religiosity and Economic Performance: The Role of Personal Liberties. In *Advances in the Economics of Religion* (pp. 405-422). Palgrave Macmillan, Cham.

Miguel, E., & Gugerty, M. K. (2005). Ethnic diversity, social sanctions, and public goods in Kenya. *Journal of Public Economics*, *89*, 2325–2368.

Montalvo, J. G., and Reynal-Querol, M. (2012). Inequality, polarization, and conflict. In M. Garfinkel & S. Skaperdas (Eds.), *The Oxford handbook of the economics of peace and conflict*, 152-178. Oxford: Oxford University Press.

Münster, J. (2007). Simultaneous inter- and intra-group conflicts. *Economic Theory*, *32*, 333–352.

Olson, M. (1965). *The logic of collective action: Public goods and the theory of groups*. Cambridge, MA: Harvard University Press.

Ortega, J., and Tangerås, T. (2008): Unilingual versus bilingual education: a political economy analysis, *Journal of the European Economic Association* 6(5):1078–1108.

Riaz, K., Shogren, J. F., & Johnson, S. R. (1995). A general model of rent-seeking for pure public goods. *Public Choice*, *82*, 243–259.

Selten, R., and Pool, J. (1991): The distribution of foreign language skills as a game equilibrium, in R. Selten (ed.) *Game Equilibrium Models IV: Social and Political Interaction*; Berlin, Springer-Verlag: 64–87.

Sen, A. (2018): "On allocation contests for publicly provided goods", *South Asian Journal of Macroeconomics and Public Finance* 7 (1): 1-16.

Strulik, H. (2016a). An economic theory of religious belief. *Journal of Economic Behavior & Organization*, *128*, 35-46.

Strulik, H. (2016b). Secularization and Long-Run Economic Growth. *Economic Inquiry*, *54*(1), 177-200.

Tullock, G. (1980). Efficient rent seeking. In J. M. Buchanan, R. D. Tollison & G. Tullock (Eds.), *Toward a theory of the rent-seeking society*, 97-112. College Station: Texas A&M University Press.

Ursprung, H. W. (1990). Public goods, rent dissipation, and candidate competition. *Economics and Politics*, *2*, 115-132.