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Social Structure, State, and Economic Activity

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Abstract

Most societies in the world contain strong group identities and the culture supporting these groups is highly persistent. This persistence in turn gives rise to a practical problem: how do and should societies with strong group identities organize themselves for exchange and public good provision? In this paper, we develop a theoretical framework that allows us to study, normatively and positively, the relationship between social structure, state capacity, and economic activity.

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I Introduction

The role of groups – based on ethnicity, race, tribe, family – in shaping economic performance remains highly contested. On the one hand, strong group identities limit the scope of cooperative behaviour among strangers and circumscribe the space for broader civic association. This social capital is important for effective functioning of institutions and contract enforcement, an important prerequisite for large scale impersonal exchange. On the other hand, there are societies without strong group identities that do poorly and others with strong identities that perform well. A second difficulty is that many, if not most, societies in the world contain strong group identities and the culture supporting these groups is highly persistent. This persistence poses a practical challenge: how should (and how do) societies with strong group identities organize themselves for large scale exchange?[1]

The "social structure" of a society is characterized not only by the type, number, and size of groups, but also by the quality of bridging ties between them. If the quality of bridging ties (or relations) between two groups is weak, then agents of those two groups will find it more difficult to interact, e.g. due to a lack of trust and due to greater asymmetry of information. Within groups, trust and reciprocity are easier to build, but sometimes the most efficient exchanges necessitate interactions across groups. The state can in part compensate for the natural difficulties in conducting economic activities across groups, providing for example contract enforcement, property rights protection, education and infrastructures that facilitate trade. Thus, the potential value of exchanges across groups depends not only on a social structure but also on the capacity of the state to help such interactions. However, the investment in institutional/infrastructure capacity necessary to facilitate inter-group exchanges is itself endogenous to the social structure: both an authoritarian ruler and a democratic institution must be expected to make the investments and policies that best reflect the interests of the powerful groups in the social structure itself. Finally, the return to ties is itself contingent on the quality of formal institutions; this bridging ties will adapt to nature of institutions. This paper provides a normative and positive theory about the relation between social structure and institutional infrastructure investment and the consequent economic performance. We first consider the setting with given social structure and then we consider the co-evolution of social structure and institutions.

[1]Weber [1951] offers an early discussion of the role of groups in society. Henrich [2020] provides a recent overview of the research on the role of groups in society. Guiso et al. [2016] provide evidence on persistence of culture over long periods of time.

Individuals belong to groups (that are defined by race, language or religion, depending on the empirical context) and they derive utility from exchange. Exchange with members of one's own group yields a utility that is normalized to one. Exchange with members of a different group occurs only if one's group has a tie with that group. The value of exchange between members of two groups depends on the quality of the tie *and* on the institutional infrastructure. We consider two types of services provided by the state – (1) *pure public goods* (that include public utilities like sewage, electricity, defence) and (2) *institutions and infrastructure* (that include transport facilities but also include legal and police enforcement).[2] The latter group of services facilitate cross-group exchange. Building on the tradition of Tocqueville [2004] and Putnam, Leonardi, and Nanetti [1993] (for a recent paper on this theme, see Jackson and Xing [2021]) we assume that bridging ties and institutional infrastructures are *complementary*.[3] Given a social structure, define *access* for an individual i in group l as the number of individuals who belong to groups with whom group l has a tie. Aggregate access in a society is the sum total of access across all individuals.

As a normative benchmark, we study the taxation and the allocation of revenue between pure public goods and infrastructure that maximizes the sum of individual utilities.[4] The returns from pure public goods are independent of the social structure while the returns from infrastructure are increasing in access. We distinguish between two types of societies: *bridged* and *segmented*. A society is said to be bridged if it is optimal to invest in both types of public goods, and it is segmented if it is optimal to invest only in the pure public good. There exists a threshold level of aggregate access: below this threshold, the state allocates all revenue to pure public goods; above this threshold the state allocates revenue to both type of public goods. Moreover, the rate of taxation and the share of the revenue allocated to infrastructure is increasing in the level of aggregate access (Proposition 1).[5]

[2]Education could enter the second category, since it increases the shared-culture component and can reduce difficulties to communicate and acquire information.

[3]A number of authors have suggested that informal social ties of trust and the institutional infrastructure may be substitutes for one another: see Levi and Stoker [2000], Braithwaite and Levi [1998], Acemoglu and Robinson [2019], Fukuyama [1995b] and Gerschenkron [1962]). Our view is that some types of ties will be substitutes while others will be complementary to formal institutions. In this paper, we focus on the case of complements. The theoretical implications of complementarity are consistent with empirical patterns we report in section the Appendix.

[4]Throughout we assume, for simplicity, that individuals have the same endowments. This eliminates the motivation for pure tax and redistribution schemes. In the concluding section we discuss different ways to introduce inequality and redistribution in our framework and how that would effect the public policy outcomes.

[5]In modern states, redistributive transfers are a major component of the government's expenditures.

In a society with small groups and a limited access, taxation is low and entirely allocated to pure public goods. Economic exchange takes place mostly within groups but it is at a very low level, as groups are small. As bridging ties expand and the aggregate access grows, the tax rate rises and institutional infrastructure grows; the state now allocates resources to both pure public goods and infrastructure. In a society with large groups and limited access, taxation is low and entirely allocated to pure public goods, but significant economic exchange can still be undertaken as groups are large. As bridging capital grows in this society, investment in infrastructure becomes attractive. However, the large groups set an upper bound on aggregate access and this in turn limits the scope of institutional infrastructure and productive economic exchange. Thus societies with small groups attain higher economic performance when bridging ties are dense, societies with large groups exhibit superior performance when bridging ties are weak (Proposition 2).

We then turn to the study of democratic decision making and show that majority voting on taxation and the allocation of tax revenue can be studied using the preferences of the median voter. There is a threshold access level for the median voter: below this level, tax revenue is allocated entirely to pure public goods and the marginal returns to these pure public goods determine the tax rate. Above this threshold, the median voter sets a tax rate that is increasing in access level and the share of infrastructure in budget grows with median access (Proposition 3). Thus the difference between the utilitarian and democratic outcome turns on the relation between mean and median access.[6]

The first part of the paper takes bridging ties as fixed. In the longer run, we expect

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We discuss the trade-offs between redistribution and other forms of expenditure in the concluding remarks.

[6]As many countries have authoritarian governments, it is important to discuss them. In the context of our model, one approach would be to suppose that an authoritarian government represents the interests of a single group and ignores the other groups in society. This determines a biased use of resources in favor of the dominant group. The analysis of dominant group can be carried out using the same methods as we employ for the utilitarian planner: the only difference is the dominant group will choose formal institutions in line with aggregate access of the group (instead of the aggregate access of society). We discuss this at the start of section B.
The "selectorate" theory of De Mesquita et al. [2005] predicts that in an authoritarian regime the resources are either allocated to private goods for the (small) winning coalition that supports the regime, or else in pure public goods such as defense or war, while institutional infrastructure to facilitate a balanced development of trade opportunities across groups in society is not contemplated in the framework. See also Deacon [2009] on the propensity of authoritarian regimes to go for transfers rather than investments. However, no paper exists on how an authoritarian regime allocates expenditure between pure public goods and institutional infrastructures. Using our framework, the divergence between the authoritarian government and the utilitarian outcome would be an increasing function of the distance between the mean access and the access of the dominant group that makes the decisions. This general approach is helpful when we turn to the mapping of our model on to the experience of countries (see section A).

that in a society with high median access, groups that have few or no ties will realize that bridging ties can generate large benefits and they will make efforts to build such ties. As they invest in creating ties, the median access may itself change and this will create further changes in state infrastructure. By contrast, in a society with a very small median access, there will be little investment in state infrastructure and bridging ties between communities will generate little economic value. Groups with ties will have little incentive to keep these ties in use; as they erode, the median access may fall further and that will have further ramifications for links.

Section IV studies the co-evolution of state and society. We introduce the possibility of investments that help build bridging ties between groups. One natural form of bridging ties would be the creation of trade or political associations that bring members of two groups together (as in the work of Varshney [2001]). A second interpretation is the building of 'directed' trust.[7] We study the co-determination of bridging ties and state infrastructure. This leads us to define the concept of a *stable society and state configuration* (SSSC in short). A configuration of taxes, institutional infrastructure and bridging capital network is said to be a SSSC if the tax and state correspond to the median access in the network, and if the network is pairwise stable given the tax and infrastructure (see Jackson and Wolinsky [1996]).

The key predictions of the co-determination theory are, one, a stable bridging capital network is a *nested split graph*: in a society, more attractive groups will have (weakly) more ties and their set of neighbouring groups constitute a superset of the set of neighbours of less attractive groups (4). Two, given the size distribution of groups, there will typically exist multiple stable configurations – that can be ordered from lowest to highest bridging capital. Three, a stable configuration with higher bridging capital will exhibit greater institutional infrastructure.

We have not been able to locate data at the level of granularity that would allow us to measure the distribution of bridging ties and of access so as to test our results directly.[8] To make progress, we use two strategies in our empirical work. First, we present detailed country case studies (see section A in the Online Appendix). In countries where

[7]Moving from the ideas of *generic* goodwill developed by Tabellini [2008] and the literature on intergenerational transmission of values (see Bisin and Verdier [2000] and Bisin and Verdier [forthcoming]), we make such efforts 'specific' and directed from one group to one other group. This brings us in the direction of an endogenous determination of the level of moral universalism in a society, as in Enke [2019].

[8]For an early study of cross-group bridging ties in six Indian cities, see Varshney [2001]. Empirical research on social networks mostly studies ties at a bilateral level between individuals or households, as in the well known American AddHealth database (Moody [2001], Mouw and Entwisle [2006], Currarini et al. [2009]) and the Indian village level social networks data (Banerjee et al. [2013]). This work reveals considerable heterogeneity in how groups link with each other.

some groups are well connected while a majority of the groups are poorly connected, median access is lower than mean access. Well connected elites support institutional infrastructure that serves their economic needs. However, once universal suffrage arrives, the median voter has low access and presses for pure public goods. We use this prediction of the theory to account for the experience of Zimbabwe and South Africa after majority rule was introduced. On the other hand, in societies where the majority of groups are well connected but there exists a significant minority of population that is isolated, the median access will be larger than the mean access. In such countries, democratic politics will lead to large investments in trade infrastructure. The potentially large minority that does not gain from such investments will press for pure public goods. We relate these theoretical predictions to the persistent tensions between the state and indigenous groups in India and in Latin American countries.

Second, we use as proxies for access some standard measures of trust taken from the literature (Enke [2019], Knack and Keefer [1997], Glaeser, Laibson, Scheinkman, and Soutter [2000], Aghion, Algan, Cahuc, and Shleifer [2010], Algan and Cahuc [2014], and Cook, Levi, and Hardin [2009]). Specifically, building on the influential work of Henrich [2020] and Enke [2019], we use the notion of *out-in-group trust*. This is a measure of the difference between trust towards outsiders and trust towards own-group members and in our view offers a good proxy for our notion of access. We find that there exists a positive correlation between tax/GDP rate and out-in-group trust, *after we control for group size distribution*; a finding that is in line with our theory on endogenous bridging ties. Section B in the Online Appendix presents this analysis.

Our paper contributes to the study of the relations between society, markets, and the state and lies at the intersection of three important strands of research: one, a theoretical literature on the relation between social structures and markets (see e.g., Hirschman [1997], Kranton [1996], Gagnon and Goyal [2017]), two, the study of the relation between ethnic heterogeneity and public good provision (see e.g., Meltzer and Richard [1981]Alesina, Devleeschauwer, Easterly, Kurlat, and Wacziarg [2003], Alesina, Baqir, and Easterly [1999], Boix [2003], Besley and Persson [2013], Scheve and Stasavage [2016], Sokoloff and Zolt [2007], Suryanarayan and White [2021])[9] and three, the co-evolution of culture and institutions (see e.g., Tabellini [2008], Bisin and Verdier [forthcoming], Bisin and Verdier [2023]). The novelty of our work lies in the central role of groups

[9]Cruz et al. [2020] study the relationship between public good provision and social fractionalization, in a context where public goods are provided by politicians facing political competition. They exploit large-scale data on family networks to identify clans in villages, and document a positive correlation between public good provision and fractionalization. They focus on the distribution of clan sizes within villages, however, and do not look at ties between clans.

and bridging ties between them. To the best of our knowledge, the following theoretical results are novel: one, the relation between mean and median access and the size and nature of public goods, two, on the nested split graph structure of bridging capital networks, and three, on the correlation between bridging capital and public goods, *after controlling for group size distribution*. Given the salience of group identities in most parts of the world, we hope that these theoretical results will direct attention toward the collection of new data on bridging ties between communities.[10]

II Model

We consider a society of individuals, $N = \{1, .., n\}$, who belong to $M = \{1, .., m\}$ groups, where $m \geq 1$. We will assume that every individual belongs to one and only one group. The size of group j is denoted by s_j ; the vector of group sizes is $\mathbf{s} = \{s_1, .., s_m\}$, so that $\sum_j s_j = n$. The groups are connected through a network of bridging ties. The groups and the bridging ties together constitute a social structure that we denote by g. Our notion of groups could apply to families, lineages, tribes and ethnic groups.[11]

Bridging capital, access and utilities

An agent i with income y_i who belongs to a group j of size s_j is said to have *access* to people outside her group equal to

$$a_i(g) = \sum_{j'} g_{jj'} s_{j'}$$

where $0 \leq a_i \leq n - s_i$. This is the number of people in other groups with whom i's group shares bridging ties. Define aggregate access in a society with groups s and network g as $A(g) = \sum_{i \in N} a_i(g)$.[12]

[10] For a pioneering study on bridging ties (in the form of trade associations) between Hindu and Muslim communities in India, see Varshney [2001].

[11] Individuals possess different identity markers such as race gender and religion and it would be more natural to consider cross-cutting group identities. This can be easily accomplished within our framework as follows: we could start with the social structure as a bipartite graph, with individuals on one side and organizations (sports clubs, political parties, churches and trading associations) on the other side. A link would exist between two individuals if they belong to the same organization. The links between individuals and organizations therefore induce a social network of ties between individuals. Our baseline formulation of individuals belonging to groups can be derived from this more micro-founded bipartite representation. Our methods and results would carry over to this alternative model.

[12] In our model access is defined in terms of direct connections only. The other extreme possibility would be to consider access in terms of groups to whom there is a path in the network. Our analysis will

Economic activity is characterized by bilateral exchanges, but exchanges between two agents of different groups are characterized by incomplete information, lack of commitment and lack of trust. A group serves as an informal institution that mitigates (or eliminates) these frictions. We normalize the payoff of an exchange within a group to 1. Agents can carry out exchange with people outside their group, but their awareness of such opportunities and the costs of carrying out such exchange are shaped by the bridging ties their group has with other groups. We will assume that an agent can engage in economic activity with members belonging to another group only if there exists a bridging tie between the respective groups. We can call the set of bridging ties in a social structure the *bridging social capital* of that society.[13] The information facilitated by a bridging tie may be about economic opportunities or about the behaviour of individuals. To capture this in a simple form, we assume that in case there exists a tie between two groups, an exchange between two members of such different groups in the absence of government intervention yields a payoff of k which is less than 1, to reflect the lower trust, information and enforcement across groups.[14]

The payoff of an agent is her initial income plus the expected gains from exchange. Exchange takes place both within one's group as well as across groups (with probabilities depending on group sizes). The payoff of agent i with income y_i in a group j that is embedded in a network g is

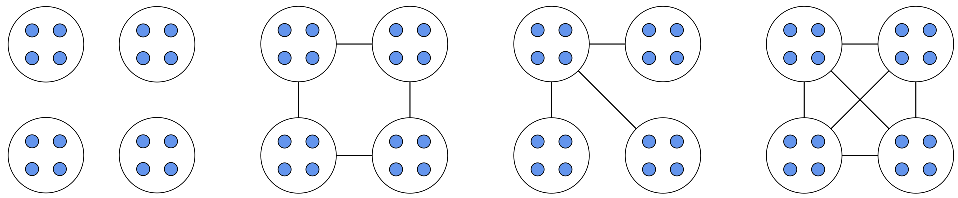
$$u_i = y_i + \frac{s_i - 1}{n - 1} + \frac{a_i}{n - 1}k. \tag{1}$$

There are different ways to interpret this formulation. We can suppose that for any individual there is a unique potential partner who is picked uniformly at random from

carry over for that case, with minor changes. More generally, one may wonder if intermediate groups will extract a rent. This raises issues on how rents are determined and how networks are formed in the presence of such rents. We leave these questions to future work. For a survey of the research on intermediation in networks, see Goyal [2023].

[13]Bridging ties may reflect a wide range of connections. One natural example is a physical tie – two communities may invest to build a bridge across a river that separates them. This creates the possibility of trade between them, but the trade is subject to opportunism. A second example arises if members of two groups take part in common associations (see e.g. Varshney [2001], Putnam et al. [2000]). Other examples come from the possibility of intermarriage or military alliances against common enemies (see e.g. König et al. [2017] and Goyal [2023]).

[14]Even when bridging ties between groups exist, they will vary in quality: social distance or language differences may affect the value of a tie. This heterogeneity, though interesting, is beyond the scope of our paper. In our model two groups with a bridging tie have the same k expected value of trade as another pair of groups with a bridging tie in the same society. The group of blacks and the group of whites may have stronger ties if for instance most of them share the same religion or language; notions of social distance and how they affect behaviour are discussed in Akerlof [1997].



(a) $A(g) = 0$. (b) $A(g) = 128$. (c) $A(g) = 96$. (d) $A(g) = 192$.

Figure 1: Networks with equal size groups: $n = 16$, $m = 4$.

the population and that the agent initiating the trade earns all the gains from trade.[15]

We illustrate the role of networks of bridging capital and group size in shaping access. Figure 1 presents societies with equal sized groups. In these examples, $n = 16$ and each group contains $s_j = s = 4$ individuals. In Figure 1(a) access is zero for everyone, $a_i(g) = 0$ and $A(g) = 0$. In Figure 1(b) $a_i = 8$ for every $i \in N$, and $A(g) = 128$. In Figure (1)c, for a member of the 'hub' group $a_i = 12$, while for members of the 'spoke' groups access $a_i = 4$; aggregate access is $A(g) = 96$. Finally, in Figure 1(d), every person has the same access given by $a_i(g) = 12$ and aggregate access is $A(g) = 192$.

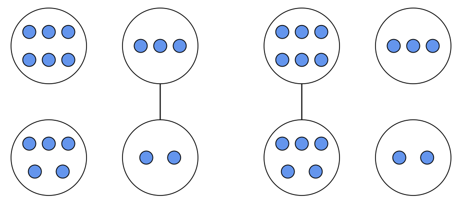
Figure 2 presents societies with unequal groups. In these examples, $n = 16$, but groups contain 6, 5, 3 and 2 members, respectively. In Figure 2(a) access is zero for members of the two larger groups and respectively $a_i(g) = 2$ and $a_i(g) = 3$ for members of the two smallest groups. Aggregate access is $A(g) = 12$. In Figure 2(b) access is zero for members of the two smaller groups and respectively $a_i(g) = 5$ and $a_i(g) = 6$ for members of the two larger groups; aggregate access is $A(g) = 60$.[16]

The government

The government chooses a linear tax rate τ with $0 \leq \tau \leq 1$, and decides how to use the tax revenue between generic public goods and investments in infrastructures that improve contract enforcement across groups. As a normative benchmark, we will consider the utilitarian optimum. In this case a planner seeks to maximize aggregate utility. We

[15] If potential gains from trade with outsiders are $\pi_O > 1$, then k/π_O represent the fraction of these gains which are realized when people trade outside of their groups, and in the absence of government intervention.

[16] In our model there is no congestion effect: an agent can trade within groups and also outside their group. In this sense there is no substitution between within and across group exchange. But, by definition, the maximum access possible for a member of a large group is smaller than the maximum access for a member of a smaller group.



(a) $A(g) = 12$ (b) $A(g) = 60$

Figure 2: Examples of networks with unequal groups: $n = 16$, $m = 4$.

will compare the utilitarian outcome to the outcome under a democratic government (with tax rates and infrastructures determined by the median voter).

Suppose that taxation induces a deadweight loss of $\frac{1}{2}\tau^2$ which reflects distortions and administrative costs. If aggregate income is Y and tax rate is τ then aggregate revenue is

$$T = (\tau - \tau^2/2)Y$$

The government chooses a tax rate τ and also chooses how to allocate the revenue T between two types of expenditures: one, a pure public goods – such as sewage, health, defence – that increases payoffs of every citizen equally: this is denoted by p, and two, investment and expenditures in institutions that is allocated to improve contract enforcement, infrastructure, and information flows, that is denoted by $\eta = T - p$. This could also include the quality of police, legislation and courts (that assist in the enforcement of contracts and laws). Protection of property rights and from abuses can compensate for the lower trust among people of different groups. The two categories are not completely distinct: education may be considered a general public good, but education in a common national language helps communication between members of different groups and may fall in this latter category.

Define $Y = \sum_i y_i$ as the aggregate income and recall that $A(g) = \sum_i a_i$ is the aggregate access in a social structure g. Given a tax rate τ, individual utility is given by

$$u_i(g, \tau) = (1 - \tau)y_i + h(p) + \frac{a_i(g)}{n-1}k(1 + F(T - p)) + \frac{s_i - 1}{n-1}$$

where $h(p)$ is the utility from a pure public good and function $F(\cdot)$ reflects the quality of infrastructures. We will assume that $h(0) = 0$, $\lim_{p \to 0} h'(p) = \infty$, $h(.)$ is strictly increasing and strictly concave. We shall also assume that $F(0) = 0$, for any positive η, $F(\cdot)$ is strictly increasing and concave. For simplicity, we will also assume that $\lim_{\eta \to 0} F'(\eta) < \infty$.

III The effects of social structure on state functioning

This section studies the baseline setting where the ties between groups are given. We start with a study of first best or utilitarian tax rates and state infrastructure. We then study democratic tax rates and state infrastructure. This analysis shows that increasing mean and median access will be associated with higher taxes. The wedge between the mean and median is a potential source for the sub-optimality of democratic decision making. We present a number of country case studies to illustrate the empirical interest of these theoretical predictions.

A Utilitarian tax rates

The benevolent state sets tax rate and allocates budget between pure public goods, p, and infrastructures, η, to maximize aggregate utility. As returns from both types of activities are strictly positive, the budget will always be binding. So $p + \eta = T = (\tau - \tau^2/2)Y$, and we will write $\eta = T - p$ in what follows.

$$\max_{\tau,p} W = (1-\tau)Y + nh(p) + \frac{A}{n-1}k(1 + F(T-p)) + \sum_i \frac{s_i - 1}{n-1}$$

A.1 Bridged and segmented societies

The government invests zero in infrastructures if aggregate access is zero and it will choose tax rate that solves the equation:

$$nh'((\tau - \tau^2/2)Y)(1-\tau)Y = Y \tag{2}$$

This equates the marginal returns from pure public goods to the marginal cost of taxation. We can rewrite this equation as follows:

$$\tau = 1 - \frac{1}{nh'((\tau - \tau^2/2)Y)} \tag{3}$$

Under our assumptions that utility $h(\cdot)$ is strictly concave and that $\lim_{p \to 0} h'(p) = \infty$, this equation has a unique solution denoted by τ^*, with an associated level of public goods given by $p^* = ((\tau^* - (\tau^*)^2/2)Y)$. Using this condition, we can infer that

Lemma 1 *The government chooses $\eta > 0$ if and only if marginal returns from infrastructures exceed the marginal rewards from pure public goods at τ^*. In other words, government will invest in infrastructures if and only if*

$$\frac{A}{n-1} kF'(0)(1-\tau^*)Y > Y. \tag{4}$$

A country where condition (4) holds is called **bridged** and a country where the condition fails is called **segmented**.

In a bridged country, the allocation of fiscal resources T between pure public goods and infrastructures is determined by the equalization of the marginal social benefits:

$$nh'(p) = \frac{A}{n-1} kF'(\eta) \tag{5}$$

The derivative of welfare with respect to tax rate in a bridged country is then

$$\frac{\partial W}{\partial \tau} = -Y + (1-\tau)k\frac{A}{n-1} YF'(\eta).$$

The optimal tax rate in this case solves

$$\tau = 1 - \frac{n-1}{kAF'(\eta)}$$

which has a solution if $kAF'(0) \geq n-1$. Denote this solution by τ_{FB}^{bri} with corresponding investments in pure public goods p^{bri} and infrastructures $\eta^{bri.}$

The welfare under the utilitarian optimum is

$$W^* = (1-\tau^{bri})Y + nh(p^{bri}) + \frac{A}{n-1} k \left[1 + F(\eta^{bri})\right] + \sum_i \frac{s_i - 1}{n-1}. \tag{6}$$

where $\eta^{bri} + p^{bri} = (\tau^{bri} - (\tau^{bri})^2/2)Y$. Elementary algebra combined with the implicit function theorem shows that in a bridged country the tax rate and the indirect utilitarian welfare are increasing in aggregate access A and that utilitarian tax rate is falling in aggregate income.

We summarize our analysis of the utilitarian problem as follows.

Proposition 1 *Suppose that $kAF'(0) \geq n-1$. The utilitarian optimal tax rate in a bridged country, τ_{FB}^{bri}, and the allocation of budget between pure public goods, p^{bri}, and infrastructures,*

η^{bri}, are the unique solutions to the following system of equations:

$$\tau_{FB}^{bri} = 1 - \frac{n-1}{kA(g)F'(\eta^{bri})}; nh'(p^{bri}) = \frac{A(g)}{n-1}kF'(\eta^{bri}).$$

Optimal tax rate τ_{FB}^{bri}, infrastructures η^{bri}, and welfare are all increasing in aggregate access $A(g)$ while public goods p^{bri} is decreasing in aggregate access. Optimal tax rate is falling in aggregate income Y.

The utilitarian optimal tax rate in a segmented country, τ_{FB}^{seg} is a solution to:

$$\tau_{FB}^{seg} = 1 - \frac{1}{nh'((\tau^{seg} - (\tau^{seg})^2/2)Y)} \tag{7}$$

Pure public goods, $p^{seg} > 0$, and infrastructures, $\eta^{seg} = 0$. Optimal tax rate is falling in aggregate income Y.

The proof is provided in the Appendix. The following example illustrates the role of social structure in shaping optimal state functioning.

Example 1 *Utilitarian Optimum: Role of social structure*

Consider 4 groups each with 4 people, so $n = 16$, $s_i = s = 4$. Aggregate access is then 0, 96, 128, and 192 for the empty, clique, circle, and complete network, respectively. Suppose $k = \frac{1}{8}$ and $Y = 1000$. Then, applying Proposition 1, we can show that the optimal tax rate τ is given by 0.058, 0.058, 0.063, and 0.375, respectively. The size of pure public good is 56.7, 56.7, 56.25, and 25 respectively while the size of infrastructures is 0, 0, 4.3, and 279.7 respectively.

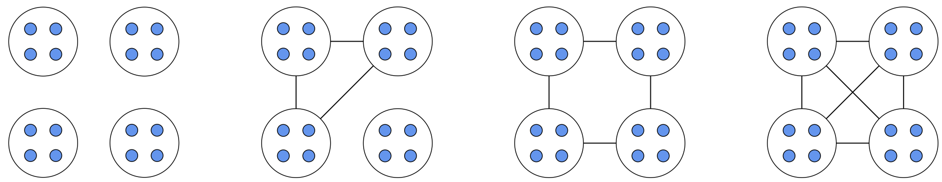
So welfare for empty network is 1065.3, for the clique of 3 network is 1066.1 for the circle network it is 1066.4 and for the complete network it is 1157.3. Thus, holding group size fixed, starting at a network where the utilitarian optimal tax rate is positive, adding links raises welfare. These computations are illustrated in figure 3.

■

A.2 The role of group sizes

In a segmented society where the state does not invest in making trades easier across groups, the size of groups is irrelevant for welfare. On the other hand, in a bridged society group sizes matters for utilitarian welfare analysis.

To develop a feel for the considerations that arise, we present an example of a society with group sizes equal to 1.



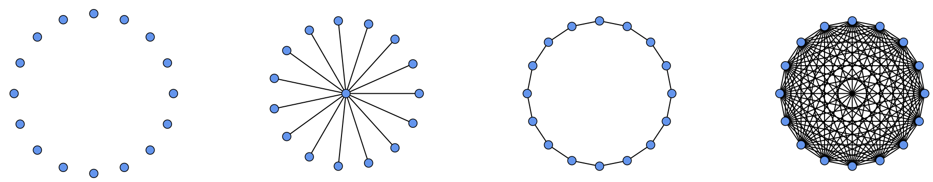
(a) Access:0
Tax: 0.058
Welfare: 1065

(b) Access: 96
Tax: 0.058
Welfare:1066

(c) Access: 128
Tax: 0.063
Welfare: 1066

(d) Access: 192
Tax: 0.375
Welfare:1157

Figure 3: Utilitarian Outcome: effects of networks with large groups



(a) Access:0
Tax:0.058
Welfare: 1062

(b) Access: 30
Tax: 0.058
Welfare: 1062

(c) Access: 32
Tax: 0.058
Welfare: 1062

(d) Access: 240
Ta: 0.5
Welfare: 1284

Figure 4: Utilitarian Outcome: effects of networks with small groups

Example 2 *Role of social structure: small groups.*

Consider a society with $n = 16$. Incomes are as before in the previous example, so that $Y = 1000$. Suppose every group has only one member; so $m = 16$. In this situation, there is no within-group exchange. Then, applying Proposition 1, we can show that the optimal taxation τ is given by 0.058, 0.058, 0.058, and 0.5 respectively. The size of pure public good is 56.7, 56.7, 56.7, and 16, respectively while the size of infrastructures is 0, 0, 0, and 359 respectively.

So welfare for empty network is 1062.1, for the star network is 1062.3, for the circle network it is 1062.3 and for the complete network it is 1284. Thus, holding group size fixed, starting at a network where the utilitarian optimal tax rate is positive, adding links raises welfare. Figure 4 illustrates these computations.

■

Example 1 tells us that if every group has 4 members, welfare for empty network is 1065.3, for the clique of 3 network is 1066.1 for the circle network it is 1066.4 and for the complete network it is 1157.3. Example 2 shows that if every group is of size 1, welfare for empty network is 1062.1, for the star network is 1062.3, for the circle network it is 1062.3, and for the complete network it is 1284. Hence for small and moderate aggregate access, a society with large groups has higher welfare, but for sufficiently high access levels, a society with smaller groups will have higher welfare.

With these observations in mind, we now develop the general conditions under which societies with large and small groups do better, respectively.

Consider any distributions of group sizes $\mathbf{s} = (s_i)_i$ and $\mathbf{s}' = (s_i')_i$. Denote by $\bar{s} = \frac{1}{n}\sum_i s_i$ the average group size. Let $A(\mathbf{s})$ denote the maximal level of aggregate access for this size distribution, i.e., when the network between groups is complete. Note that in the complete network, for each individual i, $s_i - 1 + a_i = n - 1$, and this leads to

$$\sum_i (s_i - 1) + A(\mathbf{s}) = n(n-1)$$

or, equivalently,

$$A(\mathbf{s}) = n^2 - n\bar{s}$$

Denote by $U(\mathbf{s})$ the gains from trade within, i.e.

$$U(\mathbf{s}) = \sum_i \frac{s_i - 1}{n-1}$$

and note that

$$U(\mathbf{s}) + \frac{A(\mathbf{s})}{n-1} = n$$

Denote by $\eta(\mathbf{s})$ the level of investment in a bridged society with aggregate access $A(\mathbf{s})$.

If this society satisfies also the condition

$$k[1 + F(\eta(\mathbf{s}))] > 1 \tag{8}$$

it follows that at the utilitarian optimum, gains from a trade to an outsider are larger than gains from trade to an insider. Then the next proposition holds:

Proposition 2 *Consider two bridged societies with the same aggregate income Y and group size distributions* $\mathbf{s}$ *and* $\mathbf{s}'$ *such that* $\bar{s}' < \bar{s}$.

1. Given an aggregate access level A feasible for both societies, welfare is higher for societies with larger average group size: $W(\mathbf{s}, A) > W(\mathbf{s}', A)$.

2. Suppose that condition (8) holds for the society with larger group sizes. There is a threshold access A^* for society with group sizes $\mathbf{s}'$ such that $W(\mathbf{s}', A) > W(\mathbf{s}, A(\mathbf{s}))$ for all $A \geq A^*$.

3. Suppose that condition (8) is violated for the society with lower average group size. Then, $W(\mathbf{s}, A(\mathbf{s})) > W(\mathbf{s}', A)$ for all $A \leq A(\mathbf{s}')$.

The proof is presented in section VI of the Online Appendix. We note that condition (8) is satisfied in our example 1 and 2: hence the effects of density of links and group size on welfare.

B Democratic decisions

For simplicity, in this section we assume that individual endowments are equal: $y_i = y$. In our model, an individual's preferred policy contains three dimensions, τ, p and η, but they are completely determined by her access. The preferences satisfy single peakedness on each policy dimension and the ideal pair τ, η is increasing in the individual's access level. In fact, note that the preferred policy bundle of individual i solves the following problem:

$$\max_{\tau,p,\eta}(1-\tau)y + h(p) + k\frac{a_i}{n-1}[1+F(\eta)] + \frac{s_i - 1}{n-1} \tag{9}$$

$$s.t.\ \ p+\eta = T = (\tau - \tau^2/2)Y. \tag{10}$$

Suppose that $\eta = 0$. In this case, optimal tax for individual i solves the equation:

$$h'((\tau-\tau^2/2)Y)(1-\tau)Y = y \tag{11}$$

Rewriting we get:

$$\tau_i = 1 - \frac{1}{h'((\tau_i - \tau_i^2/2)Y)n} \tag{12}$$

In this case, let the optimal pure public good be given by p^*. It follows that

Lemma 2 *Individual i prefers $\eta > 0$ if and only if*

$$\frac{a_i}{n-1}kF'(0)(1-\tau_i)Y \geq y. \tag{13}$$

All individuals for whom (13) does not hold have the same ideal point τ and the consequent p^*. As soon as an individual has enough access to make (13) hold for her, then the ideal τ and η must be increasing in access, while the ideal p decreases in access due to the budget constraint. Given this monotonicity, either the median individual does not satisfy (13), in which case the society chooses p^* and $\eta = 0$, or else the median voter (median access in this case) theorem makes sure that the policy bundle is the ideal triple for such an individual and contains a positive η. In other words, if the median access individual proposes her ideal triple and the rest of the population votes, her proposal passes; it cannot be defeated by pairwise majority voting by any other triple.[17]

If the individual meets condition (13) then the derivative of utility with respect to tax rate is

$$\frac{\partial u_i(g,p,\eta)}{\partial \tau} = -y + (1-\tau)Y\frac{kF'(\eta)a_i}{n-1}$$

The ideal tax rate is

$$\tau_i = 1 - \frac{1}{a_i}\frac{n-1}{knF'(\eta)}$$

This is a valid solution if $\tau \geq 0$, i.e., if and only if $a_i knF'(\eta) \geq n-1$. In this case, utility is given by

$$u_i^*(g,\tau_i,p_i,\eta_i) = \left(\frac{n-1}{ka_i nF'(\eta_i)}\right) y + h(p_i) + \frac{a_i}{n-1}k\left[1+F(\eta_i)\right] + \frac{s_i - 1}{n-1}. \qquad (14)$$

Individual preference for tax rate is increasing in their access, and the preferred tax rate of the median access voter satisfies:

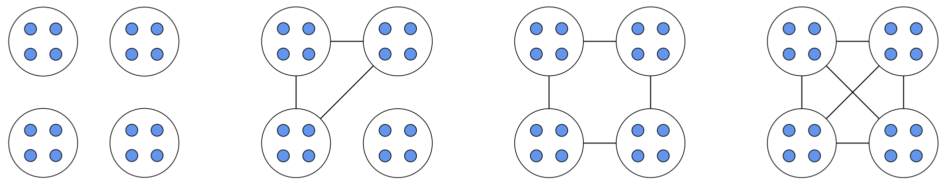
$$\tau_d = 1 - \frac{n-1}{a_d knF'(\eta)}$$

where d is such that a_d is the median access. Agents for whom $a_i > a_d$ prefer a higher tax, agents for whom $a_i < a_d$ prefer a lower tax rate and smaller infrastructures.

Proposition 3 *Suppose all individual incomes are equal. If median voter satisfies condition (13) then the democratic tax rate and allocation of public budget are the unique solutions to the system*

$$\tau_d = 1 - \frac{1}{a_d}\frac{n-1}{knF'(\eta_d)};\, h'(p_d) = \frac{a_d}{n-1}kF'(\eta_d)$$

[17] Decision-making could also be autocratic, rather than democratic. This happens, for instance, when one group j controls power and chooses the tax rate and how to allocate the tax revenues. Suppose that access of individuals in group j is a_j. Under homogeneous endowments, we can see that aggregate group utility is then simply related to utilitarian welfare of a society with aggregate access $n \times a_j$ rather than A. Following Proposition 1, a group in power then chooses a higher tax, higher infrastructure and lower public good than in the first-best if and only if access in the group is higher than average access in the population. Our arguments on link formation in section IV can be extended directly to yield analogous results on stable configurations with dominant groups.



(a) Med. Acc: 0
Tax: 0.06
Welfare: 1065

(b) Med. Acc: 8
Tax: 0.06
Welfare:1063

(c) Med. Acc: 8
Tax: 0.06
Welfare: 1066

(d) Med. Acc: 12
Tax: 0.38
Welfare:1157

Figure 5: Democratic Outcome: effects of networks

The democratic tax rate, τ_d, aggregate tax revenue, T_d, and infrastructures η_d are all increasing in a_d while public goods p_d is decreasing in a_d. Welfare increases with median access if median access is lower than average access and decreases with median access if median access is higher than average access

If for the median access individual condition (13) is violated, then the democratic tax rate, τ_d, is the unique solution to:

$$\tau = 1 - \frac{1}{nh'((\tau - \tau^2/2)Y)} \tag{15}$$

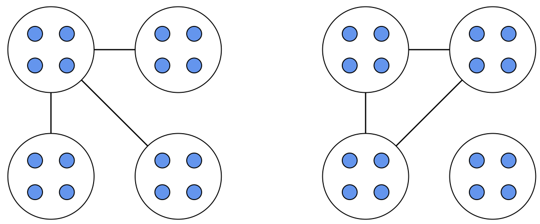
The democratic tax rate, τ_d, and aggregate state revenue, T_d, are falling in y.

The proof is presented in the Appendix. We present a numerical example to illustrate median voter decisions on tax rate and on institutional infrastructure and the implications of these decisions for welfare.

Example 3 *Democratic Outcomes*

Consider the same society as in Example 1. There are four groups with 4 people, so $n = 16$, $s_i = s = 4$. Median access is 0, 8, 8, and 12 for the empty, clique, circle, and complete network, respectively. As before let us fix $k = \frac{1}{8}$, $Y = 1000$ and $y = \frac{Y}{n} = 62.5$. Then, applying Proposition 3, the median tax rate τ is given by 0.058, 0.063, 0.063, and 0.375, respectively. The size of the pure public good is 56.7, 56.2, 56.25, and 25 respectively while the size of infrastructures is 0, 0, 4.3, and 279.7 respectively. So welfare for empty network is 1065.3, for the clique of 3 network is 1063, for the circle network it is 1066.4 and for the complete network it is 1157.3. Figure 5 presents democratic outcomes.

■



(a) Median < mean (b) Median > mean

Figure 6: Mean and median access

C Utilitarian vs Democratic Outcomes

From Proposition 1, the utilitarian optimum tax rate is $\tau_{FB} = \max\{\tau_{FB}^{bri}, \tau_{FB}^{seg}\}$. where

$$\tau_{FB}^{bri} = 1 - \frac{n-1}{kA(g)F'(\eta_{FB}^{bri})}; \tau_{FB}^{seg} = 1 - \frac{1}{nh'((\tau_{FB}{}^{seg} - \tau_{FB}^{seg2}/2)Y)}$$

From Proposition 3, the democratic tax rate is $\tau_d = \max\{\tau_d^{bri}, \tau_{FB}^{seg}\}$. where

$$\tau_d^{bri} = 1 - \frac{(n-1)}{ka_d nF'(\eta_d^{bri})}$$

For ease of exposition, let us focus on the case where society is bridged (condition (4) is satisfied) and median voter prefers infrastructures (condition (13) is satisfied). In this situation, we are comparing:

$$\tau_d(g) = 1 - \frac{(n-1)}{ka_d nF'(\eta_d^{bri})} \quad \textbf{vs} \quad \tau^{bri}(g) = 1 - \frac{n-1}{kA(g)F'(\eta_{FB}^{bri})} \tag{16}$$

We see that the relative tax rates will depend on the comparison between average access and median access: utilitarian tax rates are larger (smaller) than democratic tax rates if average access is larger (smaller) than median access. Figure 6 illustrates two networks: in the star network the median access is smaller than the mean access (4 vs 6), while in the latter network the median access is larger than the mean access (8 vs 6). ■

Turning to a general analysis of networks and many groups, let us suppose that every group has the same size s, i.e., $s_i = s$. Then, access of individual i in group j is proportional to degree $a_i = sd_j$. Denote median degree by d_d and average degree by $\bar{d}$.

Corollary 1 *Suppose that everyone has the same income, every group has the same size and there is investment in infrastructures under both the utilitarian and democratic regimes. Then democratic institutional infrastructure and utilitarian institutional infrastructure are identical if and only if* $d_d = \bar{d}$*. If* $d_d < \bar{d}$ *then infrastructures are smaller in a democracy as compared to the first best. If* $d_d > \bar{d}$ *then formal institutional infrastructure are larger in a democracy as compared to the first best.*

We conclude with a few remarks on the effects of changes in network on institutional infrastructure and economic outcomes. Throughout we suppose wealth levels are equal and group sizes are also equal.

First consider the addition of links in a network. Assume that in the original network optimal infrastructure is positive. Addition of links will increase mean degree and hence raise aggregate access. This will lead to a larger tax rate and larger institutional infrastructure (and a correspondingly larger welfare). In a democratic regime, adding a link will affect tax rate only if it raises the median degree.

Second, consider changes in the distribution of links: a mean preserving spread of number of ties. By construction, the mean remains unchanged, and so the aggregate access and the utilitarian tax rate remain unchanged. This also means aggregate welfare remains unchanged. However, a mean preserving change in degrees can alter the median degree and this will impact tax rate in a democratic regime. When we move from a society with equally connected groups to a society with a central group, welfare will increase with median degree if and only if median is lower than the mean degree.

The theory developed in this section shows that utilitarian tax and public policy are determined and increasing in mean access; by contrast in a democracy tax and public policy is determined and increasing in median access. We identify the wedge between the mean and median as a potential source for the sub-optimality of democratic decision making.

Our theoretical predictions are consistent with the historical and ongoing experience of a number of countries. Section A in the Online Appendix presents the country case-studies. We carry out two sorts of exercises. First, we classify countries on two dimensions – large versus small groups, and high versus low bridging capital. So there are four types of countries in all. We discuss the following countries – South Korea (large groups, high bridging capital), Nigeria and Congo (large groups, low bridging capital), WEIRD societies (small groups, high bridging capital), Russia (small groups, high bridging capital). Second, we classify countries in two categories – those with mean access larger/smaller than median access. A prominent instance of mean larger than median is a settler society in which the colonising groups are small but well-connected, while the vast majority of the population is constituted of indigenous groups and these groups have limited bridging ties. Examples of such societies include Zimbabwe and South Africa and a number of Latin American countries (we discuss Peru and Mexico in detail). We next take up countries in which the median is larger than the mean access. One instance of such a situation is a society where a majority of the population belongs to well connected groups but there also exists a significant minority of the population belonging to groups that are isolated. Examples of such societies include India and the United States: they have relatively large indigenous groups that are relatively isolated from each other and from the majority groups.

IV Co-determination of Bridging Social Capital and State Capacity

In the longer run, bridging ties will adapt to state activities. For instance, in a society with large median access, groups that have few or no ties will realize that bridging ties can generate large benefits and they will make efforts to build such ties. As they invest in creating ties, the median access may itself change and this will further change state infrastructures. On the other hand, in a society with a very small median access, there will be little investment in state infrastructure and bridging ties between communities will generate little economic value. Groups with ties will have little incentive to keep these ties in use; as they erode, the median access may fall further and that will have further ramifications for links. This section analyzes the outcome of this co-evolution of state and society.

We now introduce the possibility of investments that help build bridging ties between groups. A simple interpretation would be the creation of physical infrastructure (like a road or a bridge) between two physically separated communities. A second interpretation of this investment is the creation of associations as in the work of Varshney [2001]. A third interpretation is the building of directed trust and altruism as in the model of cooperation developed by Tabellini [2008] and the literature on intergenerational transmission of values (see Bisin and Verdier [2000] and Bisin and Verdier [forthcoming]). In these different interpretations, it is reasonable to suppose that creating a bridging tie between two groups is costly and that it is a directed activity that the two groups undertake. We denote the cost of such activity for each group by $C > 0$. The benefits to two groups from a bridging tie lie in the possibility of exchange between the groups.

A state and society configuration is given by (τ, η, g). Our interest is in configurations where the state infrastructure is chosen by the median voter in the network and the network itself is consistent with the incentives of different groups to build ties amongst themselves.

Definition 1 *A state and society configuration (τ, η, g) is stable if*

1. *(τ, η) is the optimal choice of the median voter in network g.*
2. *g is a pairwise stable network given the state (τ, η).*

Recall, from Jackson and Wolinsky [1996], that a network g is pairwise stable if there is no incentive for j or l to delete a link, $g_{jl} = 1$, that is present in g and there is no incentive for nodes j and l to add a link that is absent, $g_{jl} = 0$, in g.

We have already discussed the determination of state policy by median voter in section B. Next consider the returns to link building. Building on the model in section II, the returns to a group j with aggregate income y_j, size s_j, and access a_j in a network g are given by

$$(1-\tau)y_j + s_j h(p) + s_j \frac{a_j}{n-1} k(1+F(\eta)) + \frac{s_j(s_j-1)}{n-1} \tag{17}$$

The marginal returns to a group j from building a tie with a group l are then proportional to the product of their respective sizes and given by:

$$s_j s_l \frac{k(1+F(\eta))}{n-1} \tag{18}$$

We note that the marginal returns to a link are symmetric: the return of group l from a link with group j are equal to the returns of group j from the link with group l, and these returns are increasing in the size of the groups. This means that if a group of size s finds it attractive to form a link with a group of size s' then it will also find a link with a group of size larger than s' attractive. Similarly, the group s' will find it attractive to form a link with any group larger than s.[18]

This monotonicity of returns suggests that in a pairwise stable network the number of links will be increasing in the group size. Following Chvátal and Hammer [1977],

[18]In our model, agents differ only in the size of their groups. In practice, individuals may differ in human and financial capital and this will affect the rewards of exchange and the incentives to form bridging ties.

Mahadev and Peled [1995] and Goyal [2023], we define the notion of a nested split graph.[19] Let $D(j|G)$ be the number of degree of group j in network G.

Definition 2 *A network G is called a nested split graph if $[g_{j\ell} \in G$ and $D(q|G) \geq D(\ell|G)]$ $\implies g_{jq} \in G$*

In nested split graphs, the neighborhood of a group with higher degree is nested in the neighborhood of the group with lower degree. Figure 7 illustrates nested split graphs in a society with 6 groups: two groups of size 6 (Big), two groups of size 4 (Medium), and two groups of size 2 (Small). There are six types of links possible based on the combinations of groups: Big-Big, Big-Medium, Big-Small, Medium-Medium, Medium-Small and Small-Small. For ease of presentation, we will describe networks using shorthand notation: for example, for a network with links only between big groups and between big and medium groups we use the notation "B-B, B-M".

Another interesting feature of our setting, as revealed by equation (18) is that, given a tax rate and a state infrastructure (τ, η), there are *no* spillovers across links in the network; in other words, the marginal returns to a link between two groups are independent of any other links in the network.[20] This property is useful in developing the following characterization of stable configurations.

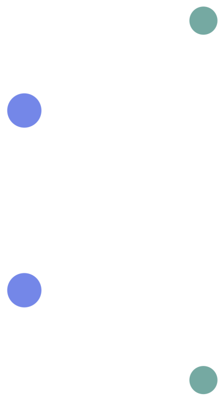
Proposition 4 *A state and society stable configuration (SSSC) exists. In any SSSC, (τ, η, g), the network is either empty or a nested split graph, where larger groups have (weakly) more links than smaller groups. For any two SSSC (τ, η, g) and (τ', η', g'), if $\tau \leq \tau'$ and $\eta \leq \eta'$, then g is a subgraph of g'.*

The proof is provided in the appendix. This result highlights two features of stable configurations: one, the monotonicity in degree with respect to group size, and two, the stable configurations are ordered: the higher tax rate and size of infrastructure goes together with a larger set of bridging ties. To develop an appreciation of the impact of cost of linking on stable configurations, we next present a numerical example of a society with six groups.

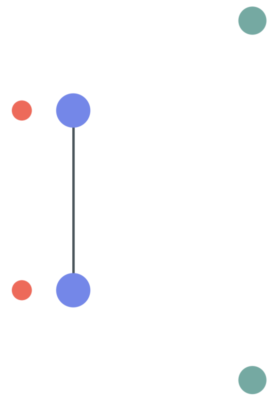
Example 4 *Illustration of Stable Configurations*

[19]For other applications of the notion of nested split graphs see Goyal and Joshi [2003] and König et al. [2014]. Also see Sadler and Golub [2024] for a recent study of the theory of nested split graphs.

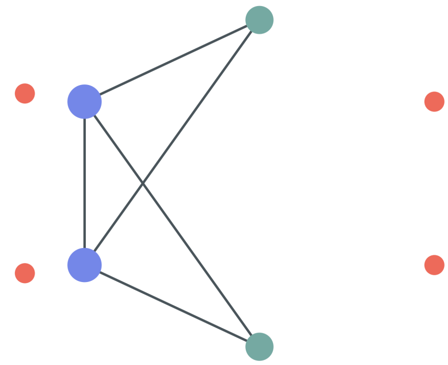
[20]Bjerre-Nielsen (2022) shows that the assortative matching among types of agents (where for us group size is the relevant type characteristic for a group) holds both with and without spillovers. Since in his setting there is no role for a government, the connection with our analysis is tenuous, but it is certainly worth exploring in future work whether our results extend to settings with network externalities.



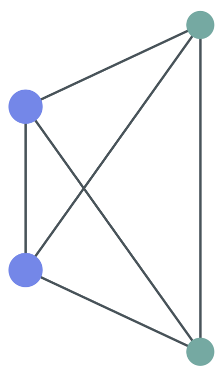
(a) Empty



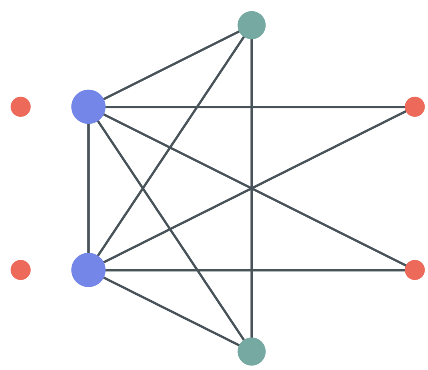
(b) B-B



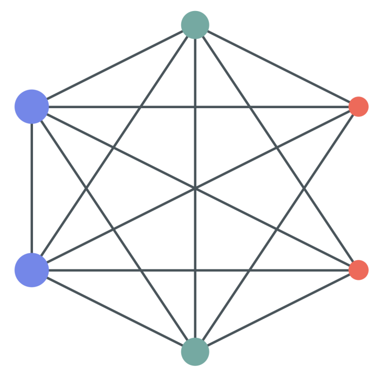
(c) B-B, B-M



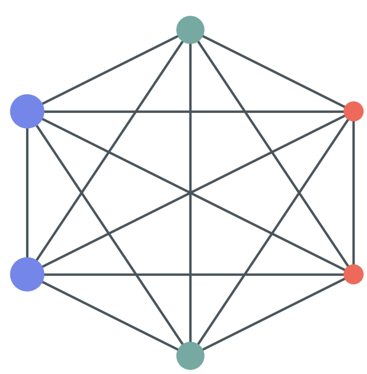
(d) B-B, B-M, M-M



(e) B-B, B-M, B-S, M-M



(f) B-B, B-M, B-S, M-M, M-S



(g) Complete

Figure 7: All Nested Split Graphs: n=24, m=6. Big Groups in Blue, Medium in Green, Small in Red

We consider a society with $n = 24$ individuals. These individuals belong to 6 groups – there are 2 groups of size 6, 2 groups of size 4, and 2 groups of size 2. Incomes are equal to 64, so aggregate income $Y = 1600$. We assume that $h(G) = G^{0.5}$. The baseline value of bridging tie $k = 0.125$, Finally, assume that the infrastructure function is $F(\eta) = \eta$.

Figure 8 presents stable configurations (we have selected parameters in such a way that stable configurations change with every change in costs). Stable configurations exhibit very different levels of networks and tax rates and state infrastructure, sometimes even when the economic fundamentals remain unchanged. Moreover, changes in stable configurations can have very large effects on aggregate welfare.

We would like to draw attention to four aspects of these computations.

- For very high costs of linking, the unique stable configuration contains the empty network. For very low costs of linking, the unique stable configuration contains the complete network.

- For intermediate costs of linking multiple stable configurations exist. Thus, two societies with similar economic fundamentals may exhibit very different levels of bridging capital and corresponding state capacity. Consider for instance the case of $C = 20$: there is a stable configuration with an empty network, tax rate $\tau = 0.06$ and state capacity $\eta = 0$ (yielding aggregate welfare $W = 2544$), but there also exists a stable configuration with a complete network, a tax rate $t = 0.60$ and state capacity $\eta = 979$ (yielding aggregate welfare $W = 2965$).

- Both min and max stable configurations grow (weakly) as C falls.

- Welfare may fall with an increase in bridging capital. Consider costs $C = 60, 40$: a move from the empty to the non-empty network leads to a *fall* in aggregate welfare. On the other hand, for low costs of linking at $C = 20, 0.1$, a move from the empty to the non-empty network always leads to an increase in welfare.

The description of stable configurations gives us a first impression of the impact of the costs of linking on stable configurations. In a setting with endogenous links, on the one hand, changes in the costs of linking have implications for the nature of state infrastructure. On the other hand, changes in the productivity of government and the baseline level of trust between linked groups have implications for bridging capital. The next result summarizes these effects. For concreteness, we focus on maximal state and society stable configurations, i.e., the society and state configurations that have the largest η and g.

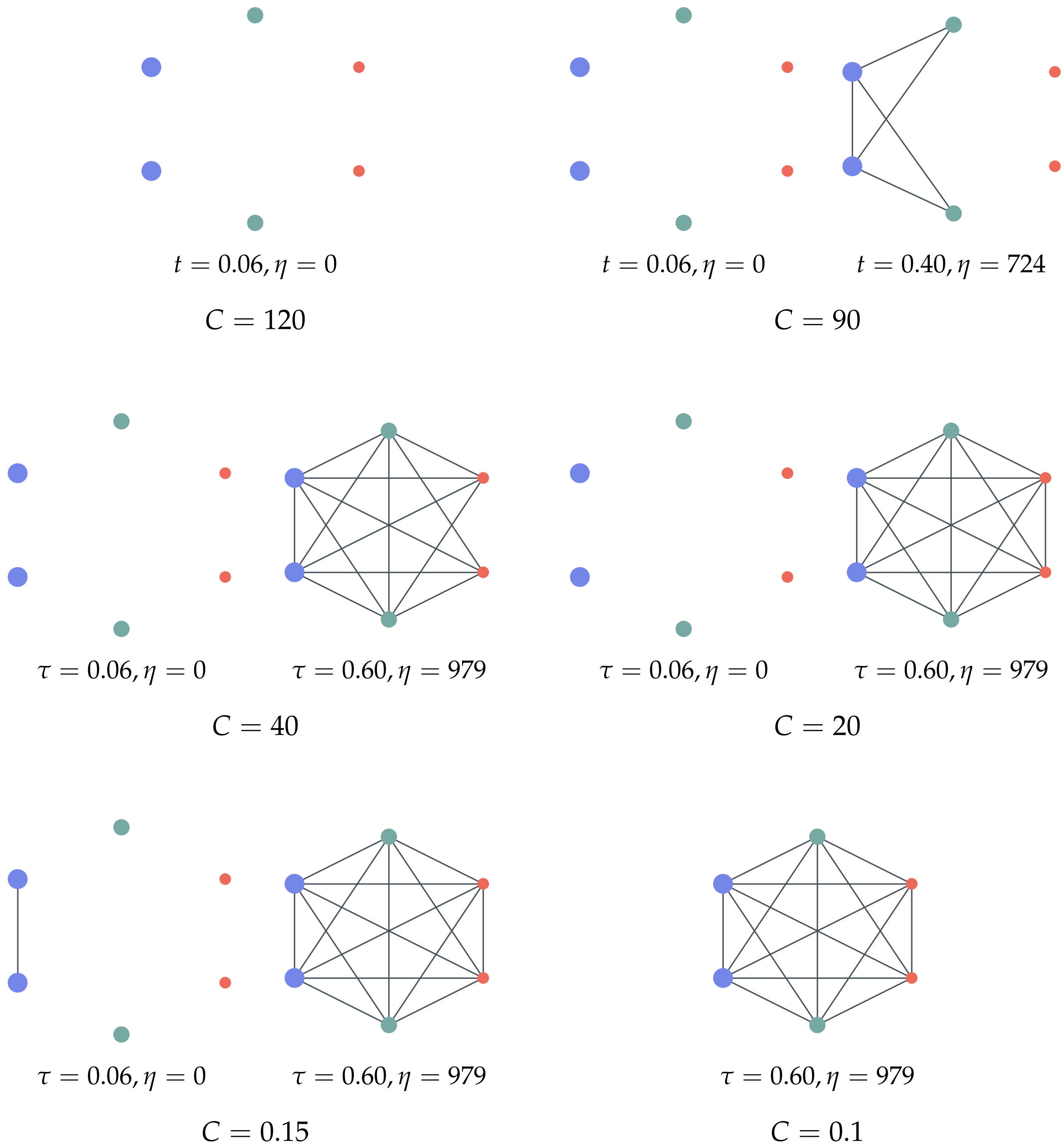


Figure 8: Stable configurations under Different Linking Costs

Corollary 2 *Changes in baseline quality of link, technology of infrastructure, and the costs of links have the following effects.*

- *Consider an increase in baseline quality of links from k to k'. The maximal SSSC under k' is (weakly) larger than the maximal SSSC under k: $\eta(k') \geq \eta(k)$ and $g(k')$ contains $g(k)$.*
- *Consider a function F' everywhere (weakly) higher than function F, then η and g in the maximal SSSC under F' are (weakly) higher than under F.*
- *A fall in costs of linking from C to C'. The maximal SSSC under C' is (weakly) larger than the maximal SSSC under C: $\eta(C') \geq \eta(C)$ and $g(C')$ contains $g(C)$.*

We now turn to a comparison between stable configurations and the first best configurations. Recall, one insight from our earlier analysis in sections A and B is that there exists a wedge between the utilitarian (or first best) outcome and democratic outcomes if and only if median access is different from mean access. How is this insight affected by the endogeneity of links? Note that conditional on investment in infrastructure, the incentives that two groups have to form a link are aligned with welfare, i.e., the net gains to group j from forming a link with group l, given by

$$s_j s_l \frac{k(1+F(\eta))}{n-1} \tag{19}$$

are equal to one half the social welfare gains from the link. This alignment of incentives is due to the absence of externalities in network formation. Note, however, that a link may affect groups if this link affects median access.

Definition 3 *A configuration (τ, η, g) is said to be first best if it maximizes aggregate social welfare.*

Through a simple adaptation of our earlier arguments in the proof of Corollary 1, we can establish the following.

Proposition 5 *Let $(\tau_{FB}, \eta_{FB}, g_{FB})$ be a first best configuration. If median access is equal to average access in this configuration then first best is also a SSSC. If median access is lower than average access then there exists a SSSC (τ^*, η^*, g^*) such that $\eta^* \leq \eta_{FB}$ and $g^* \subset g_{FB}$. If median access is higher than average access then there exists a SSSC (τ^*, η^*, g^*) such that $\eta_{FB} \leq \eta^*$ and $g_{FB} \subset g^*$.*

In particular, if median access is lower than average access in the first best configuration then decentralized – group level – incentives can lead to too few bridges between groups and this in turn can result in too little state infrastructure.

The study of stable configurations of social structure and state functioning yields a number of insights. One, a network in a stable configuration is a *nested split graph*. Two, given the size distribution of groups, there will typically exist multiple stable configurations – that can be ordered from lowest to highest bridging capital. Three, the multiple stable configurations are ordered in tax rate, size of infrastructure, and network of bridging ties. This means that, for any given size distribution of group sizes, there exists a *positive correlation* between bridging capital and state infrastructure.

We do not have granular data on bridging networks so a rigorous empirical analysis of these predictions lies outside the scope of this paper. But we present evidence that provides high level support for these theoretical predictions. First, consider the country case studies in section A in the Online Appendix. In these studies, we present evidence for larger groups having more bridging ties as compared to smaller groups in India and United States. We also present evidence that descendants of colonial settler groups in Latin America have more bridging ties than the indigenous communities in these countries. Second, to examine the positive correlation between bridging capital and state functioning, we use proxies for bridging ties such as measures of trust. Building on the influential research on generalized trust and universalism, the key measure is the difference between trust towards outsiders and trust towards group members – out-in-group trust. Our empirical analysis presented in section B in the Online Appendix shows there exists a positive correlation between out-in-group trust and tax-to-GDP ratio *after we control for ethnic fragmentation*, in line with our theory. Any future attempt to bring the theory close to the data will have to allow the cost of formation of bridging ties to vary with the geographic, genetic, and linguistic distance of groups.

V Concluding remarks

In this paper we have studied the choice of public goods and trade infrastructures for different divisions of the population in groups, with or without bridging ties, and then we have studied the co-evolution of the social structure when taking into account such a public intervention, characterizing stable societies. We have evaluated the economic performance of such societies with the utilitarian welfare maximization benchmark.

We assume equal incomes for everyone and we do not study direct redistribution from one group to another. However, our model highlights two ways in which the simultaneous consideration of social structure and state choices can generate inequality. Even in a society where initial incomes are equal, the first channel through which inequality is created is for a given social structure: if the given social structure is such that the median access individual ha access greater than the mean, she will determine policies that will create more inequality, and in particular inequality above whatutilitarian welfare would require. Beside this possibility of over production of individual inequality in a democratic state, the second channel is through the endogenous formation of bridging socialcapital: our propositions 4 and 5 suggest that larger groups are more likely to be connected and hence enjoy the benefits of a society investing a lot in trade infrastructures, while small groups are likely to remain disconnected and hence remain among the disadvantaged. This second channel generates inequality at the group size level. Given these precise channels of generation of inequality, future research could be devoted to study the dyanmics of inequality in our model, and in such a context the explicit consideration of different kinds of redistributive policies will be warranted.

Our model can be extended to include the possibility of explicit redistribution, chosen for example by the largest group in power. Redistribution is a major function of modern governments and a natural question concerns the incentives to redistribute resources with respect to using tax revenue for the types of expenditures studied in the paper. The addition of the option for a group in power (or coalition of groups in power) to use tax revenue for goods that benefit only the groups in power would create a third type of societies, *exploitation* societies, on top of the two examined categories of bridged and segmented ones. While this extension would not alter qualitatively our main insights on the complementarity of bridging capital and institutional investments in trade infrastructures, it may lead to interesting considerations for future research on democratization: allowing for the threat of redistribution in case of democratization could allow us to use our framework to study the history of democratization and the incentives to democratize for existing dominant elites, in the spirit of Acemoglu and Robinson [2005]. One potential implication of our framework for this question is that concessions of democratic reforms are more likely the more a society is bridged, since in such cases a median voter is more likely to further invest in trade infrastructures rather than going for pure public goods or pure redistribution. The empirical record of countries on democratization is mixed and a fundamental question pertains to the co-evolution of bridging social capital and democratic institutions.

In future work one could consider heterogeneities within groups, in terms of incomes and more, and in such contexts it will be important to study also the way in which heterogeneous social groups can influence public decisions. Moreover, if the choice of policy vectors is made by a majority coalition of groups, additional types of incentives to discriminate or create or destroy social capital can be considered.

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VI Appendix:Proofs

Proof of Proposition 1 1. Show, first, that the solution is unique. Note that given τ, and the strict concavity of h and concavity of F, there is a unique $\eta(\tau)$ and $p(\tau)$ that solve

$$\eta + p = (\tau - \tau^2/2)Y \quad (20)$$

$$nh'(p) = \frac{k}{n-1}AF'(\eta) \quad (21)$$

We next show that $\eta(\tau)$ increases with τ. Write $p = (\tau - \tau^2/2)Y - \eta$ and substitute

$$nh'((\tau - \tau^2/2)Y - \eta) = \frac{k}{n-1}AF'(\eta) \tag{22}$$

Take the derivative with respect to τ:

$$\begin{aligned} nh''((1-\tau)Y - \eta') &= \frac{k}{n-1}AF''\eta' & (23) \\ \eta' &= \frac{nh''(1-\tau)Y}{nh'' + \frac{k}{n-1}AF''} & (24) \end{aligned}$$

and since $h'' < 0$ and $F'' < 0$, $\eta' > 0$.

Next, the equation that characterizes the tax rate is

$$\tau = 1 - \frac{n-1}{kAF'(\eta(\tau))} \tag{25}$$

Since $F'' < 0$ and $\eta' > 0$, as τ increases from 0 to 1, the function $1 - \frac{n-1}{kAF'(\eta(\tau))}$ decreases from $1 - \frac{n-1}{kAF'(0)}$ to $1 - \frac{n-1}{kAF'(\eta(1))}$. Therefore, if $kAF'(0) \geq n-1$, there exists a unique solution to the equation.

2. Next, let us derive the comparative statics with respect to aggregate access. Note first that welfare $W(\tau, \eta, p, A)$ is increasing in A. This implies that the maximal level of welfare is also increasing in A. To show that τ and η are increasing in A, we rely on the implicit function theorem. These two parameters are solutions of

$$\begin{aligned} nh'((\tau - \tau^2/2)Y - \eta) &= \frac{k}{n-1}AF'(\eta) & (26) \\ (1-\tau)\frac{k}{n-1}AF'(\eta) &= 1 & (27) \end{aligned}$$

where we have rewritten equation (25) to obtain part 2 of (26). To simplify computations , introduce $\bar{k} = \frac{k}{n-1}$. Take the derivatives of these two equations with respect to A:

$$\begin{aligned} nh''((1-\tau)Y\tau' - \eta') &= A\bar{k}F''\eta' + \bar{k}F' & (28) \\ -\tau'\bar{k}AF' + (1-\tau)\bar{k}AF''\eta' + (1-\tau)\bar{k}F' &= 0 & (29) \end{aligned}$$

Express η' as a function of τ' from the second equation in (28).

$$\eta' = \frac{F'}{(1-\tau)F''}\tau' - \frac{F'}{AF''} \tag{30}$$

Substitute in the first equation of (28 to obtain:

$$[nh''(1-\tau)Y - (nh'' + A\bar{k}F'')\frac{F'}{(1-\tau)F''}]\tau' = \bar{k}F' - (nh'' + A\bar{k}F'')\frac{F'}{AF''} = -\frac{nh''F'}{AF''}$$

On the left hand side, the term in front of τ' is negative and the right hand side is also negative, showing that

$$\tau' > 0$$

Then from the first equation

$$-(nh'' + A\bar{k}F'')\eta' = -nh''(1-\tau)Y\tau' + \bar{k}F'$$

where the term in front of η' is positive while the right hand side is positive, showing that

$$\eta' > 0$$

Next, the derivative of public goods $p = (\tau - \tau^2/2)Y - \eta$ with respect to A is

$$p' = (1-\tau)Y\tau' - \eta'$$

and is such that

$$nh''p' = A\bar{k}F''\eta' + \bar{k}F'$$

and since $\eta' = \frac{F'}{(1-\tau)F''}\tau' - \frac{F'}{AF''}$, we have

$$nh''p' = \frac{A\bar{k}}{1-\tau}F'\tau'$$

which shows that

$$p' < 0$$

3. Finally, let us show that the optimal tax rates are falling in aggregate income. In a segmented country, the tax rate solves

$$nh'((\tau - \tau^2/2)Y)(1-\tau) = 1$$

Take the derivative with respect to Y

$$\tau'(-nh' + (1-\tau)Ynh'') = -(\tau - \tau^2/2)nh''(1-\tau)$$

showing that $\tau' < 0$. In a bridged country, the tax rate τ and infrastructures η solve

$$\begin{aligned} (1-\tau)A\bar{k}F'(\eta) &= 1 \\ nh'((\tau - \tau^2/2)Y - \eta) &= \bar{k}AF'(\eta) \end{aligned}$$

Take the derivative of the first equation with respect to Y :

$$-\tau' A\bar{k}F' + (1-\tau)A\bar{k}F''\eta' = 0$$

and hence

$$\eta' = \frac{F'}{(1-\tau)F''}\tau'$$

Take the derivative of the second equation

$$nh''((1-\tau)Y\tau' - \eta' + (\tau - \tau^2/2)) = \bar{k}AF''\eta'$$

Leading to

$$\tau'[nh''(1-\tau)Y - \frac{F'}{1-\tau}(\frac{nh''}{F''} + \bar{k}A)] = -nh''(\tau - \tau^2/2)$$

and showing that $\tau' < 0$.

Proof of Proposition 2: The first part follows from the following observation: since aggregate access is equal, the optimal tax rate will be equal. This means that returns to cross-group exchange will be the same in both groups. However, within group exchange is more extensive in the society with larger groups. Thus the society with larger groups will have a higher welfare.

We now turn to part 2 of the Proposition. Set the tax rate at the utilitarian optimum for groups of size $\mathbf{s}$ with maximal access:

$$W(\mathbf{s}, A(\mathbf{s})) = (1-\tau^*)Y + nh(p^*) + k\frac{A(\mathbf{s})}{n-1}[1 + F(\eta^*)] + U(\mathbf{s})$$

Keeping the same tax rate and allocation of public finances, welfare for groups of size $\mathbf{s}'$ is

$$W(\mathbf{s}', A) = (1-\tau^*)Y + nh(p^*) + k\frac{A}{n-1}[1 + F(\eta^*)] + U(\mathbf{s}')$$

The difference is

$$W(\mathbf{s}', A) - W(\mathbf{s}, A(\mathbf{s})) = k\frac{A - A(\mathbf{s})}{n-1}[1 + F(\eta^*)] + U(\mathbf{s}') - U(\mathbf{s})$$

The difference is increasing in A and, at the highest possible value $A(\mathbf{s}')$, we see that

$$W(\mathbf{s}', A(\mathbf{s}')) - W(\mathbf{s}, A(\mathbf{s})) = \frac{A(\mathbf{s}') - A(\mathbf{s})}{n-1}[k[1 + F(\eta^*)] - 1]$$

where the last equality comes from noting that

$$U(\mathbf{s}') - U(\mathbf{s}) = -\frac{A(\mathbf{s}') - A(\mathbf{s})}{n-1}$$

Therefore if condition (8) holds at $\mathbf{s}$, $k[1 + F(\eta^*)] > 1$ and $W(\mathbf{s}', A(\mathbf{s}')) > W(\mathbf{s}, A(\mathbf{s}))$. Finally, note that utilitarian welfare at $\mathbf{s}', A$ is higher than $W(\mathbf{s}', A)$. This completes the proof of part 2. The proof of part 3 follows using a similar argument as in part 2.

Proof of Proposition 3: The democratic public policies solve

$$\max_{\tau,\eta,p}(1-\tau)Y + nh(p) + \frac{k}{n-1}na_d(1 + F(\eta)) + n\frac{s_d - 1}{n-1}$$

leading to welfare

$$W = (1 - \tau_d)Y + nh(p_d) + \frac{k}{n-1}A(1 + F(\eta_d)) + \sum_i \frac{s_i - 1}{n-1}$$

Compute the derivative of W with respect to a_d:

$$\frac{dW}{da_d} = -\tau_d' Y + np_d' h' + \frac{k}{n-1}A\eta_d' F'$$

while the first order conditions of the democratic problem tell us that

$$-\tau_d' Y + np_d' h' + \frac{k}{n-1}na_d\eta_d' F' = 0$$

This yields

$$\frac{dW}{da_d} = \frac{kn}{n-1}(\bar{a} - a_d)\eta_d' F'(\eta_d)$$

Since $\eta_d' > 0$ and $F' > 0$, this shows that $\frac{dW}{da_d} > 0$ if $a_d < \bar{a}$ while $\frac{dW}{da_d} < 0$ if $a_d > \bar{a}$.

Proof of Proposition 4: The argument for existence of stable configuration is constructive. Start with the complete network. Consider the choice of tax rate and infrastructure $(\tau(a_d(g^c)), \eta(a_d(g^c)))$ of the median access. This $\eta(a_d(g^c)))$, together with F, and k and group sizes define the returns to linking. If the link between the two smallest groups is profitable, given cost of linking C, then so are all other links and we are at a stable configuration. If however there exist links that are not profitable then delete all such unprofitable links. We arrive at a sparser network g'. Consider the choice of tax rate and infrastructure $(\tau(a_d(g')), \eta(a_d(g')))$ determined by median access of this new network. Since the network is sparser, median access is lower, state infrastructure is lower and returns to linking are lower. Links that were unprofitable under g^c, and hence deleted, are still unprofitable. Repeat the test in first step: if all links are profitable then we are at a stable configuration. If some links are unprofitable then delete all such links and iterate. This iteration is monotonic in links, median access and state infrastructure; as the number of links is finite there exists a limit point. By construction, the limit corresponds to a stable configuration.

We next prove that in any SSSC (τ, η, g), the network is a nested split graph. Observe, first, that returns to linking are increasing in group sizes. A larger group thus forms weakly more links than a smaller group. This implies that degree is a weakly increasing function of group size. Next, assume that $g_{jl} = 1$ and $d_k \geq d_j$. By pairwise stability, $g_{jl} = 1$ implies that $s_j s_l \frac{k(1+F(\eta))}{n-1} \geq C$. Since $d_k \geq d_j$, $s_k \geq s_j$ and hence $s_k s_l \frac{k(1+F(\eta))}{n-1} \geq C$, implying that $g_{kj} = 1$. This implies that the neighborhood of the smaller degree group is nested in the neighborhood of the higher degree group, and the network is a nested split graph. Finally, we note that given (τ, η), there exists a unique pairwise stable network, generically. This is because there are no spillovers across links in our setting. So given a (τ, η), a link is profitable in any graph if and only if it is profitable in the above constructed nested split graph.

Consider two SSSC (τ, η, g) and (τ', η', g'). Suppose without loss of generality that $\eta' \geq \eta$. Then the gains from trade are also aligned, $k(1 + F(\eta')) \geq k(1 + F(\eta))$. But then it follows that g is a subgraph of g'. If the gains from trade are larger, the pairwise stable trade network is larger. We can order the set of stable configurations from lowest to highest η. The state and society stable configuration with largest η also has the largest network. In other words, this is the stable configuration with the largest gains from trade and most trades. *QED.*

Proof of Corollary 2: Start from the maximal stable configuration at k, $(\tau(k), \eta(k), g(k))$. Consider an increase in k and the following dynamic process. First, agents readjust their links, holding tax rate and state infrastructure constant at $(\tau(k), \eta(k))$. Since an increase in k corresponds to an increase in gains from trade, they form weakly more links, leading to network g' that contains $g(k)$. Second, conditional on network g' (and its weakly higher median access), they democratically choose the levels τ' and η'. We know that η' is weakly greater than $\eta(k)$ since median access in g' is weakly greater than in $g(k)$. Third, repeat steps one and two. When η increases, g increases, and then when g increases, η increases. The process is monotonic and bounded, and hence converges. The profile at which it converges is stable by construction, and hence has a weakly higher η and larger g than the maximal SSSC at k. A similar proof holds for increases in the function F and for a decrease in C. *QED*.

VII ONLINE APPENDIX

A Country Case Studies

The theory shows that increasing mean/median access will be associated with higher taxes and identifies the wedge between the mean and median as a potential source for the sub-optimality of democratic decision making. This section presents country case studies to illustrate the empirical interest of these theoretical predictions.

Group size and bridging capital: We will use a 2×2 classification of countries corresponding to small and large groups and sparse and dense bridging ties.

1. Consider first the *top-right* cell in Table 1: groups are large and bridging capital is weak. The theory suggests that the utilitarian optimum (and democratic politics) will support little tax revenue. Let us use the theory to understand the experience of Nigeria and Congo (for a general analysis of state failure in Africa, see Bates [2015], Tanku [2021], Acemoglu and Robinson [2019]).

$Groups$ \ $BridgingCapital$	Large	Small
$Large$	South Korea	Congo, Nigeria
$Small$	Weird Societies	Russia

Table 1: Countries Experience: Summary

Nigeria is the largest country by population in Africa. It became independent from Britain on October 1, 1960. The country is segmented into three large geographic regions, each of which is dominated by a single ethnic group: the west by the Yoruba (who constitute 21% of the population), the east by the Igbo (constituting 18% of the population), and the north by the Hausa-Fulani (constituting 31% of population). All in all, Nigeria has over 250 ethnic groups.

Nigeria's regional stresses – that are a reflection of ethnic competitiveness, educational inequality, and economic imbalance – came to the fore very soon after independence (Williams [2019]). The south complained of northern domination, and the north feared that the southern elite was bent on capturing power. There was unrest and disorder in the west followed by a military coup in 1966. This coup in turn created tensions across ethnic groups and the regions. By May 1967 the eastern region declared itself independent under the name of the Republic of Biafra.

This was followed by a civil war that went on for over 2 years. The Biafra region collapsed in January 1970. However, a military dictatorship continued through the 1970's. The dictatorship was able to take advantage of the high oil prices to introduce a number of changes and improvements. Elections took place in 1979 and led to a brief spell of democratic government that lasted until 1983. This period was followed by another long period of military dictatorship that lasted until 1999. Nigeria has had regular democratic elections and presidents have changed since 1999.

Viewing Nigeria through the lens of our model the great ethnic diversity and the size of the three major ethnic groups (Yoruba, Igbo, and Hausa-Fulani) and the tension between these major groups, suggests a society in which cross-group access is limited. Consistent with this limited bridging capital, we find that tax revenue has remained low: in 2022, the tax to gross domestic output ratio was 6.3% (Financial Times September 20, 2022).).

The Democratic Republic of the Congo (in what follows, simply, Congo) has a population of 68 million and is the largest country in Sub-Sahara Africa. Congo gained independence from Belgium in 1960. In 2020 the per capita income was around 580 USD, a figure that is less than one percent of Switzerland's per capita income. The low income is reflected in a life expectancy that is 20 years less than Switzerland's. This record of economic performance must be seen against the background of Congo's extraordinary wealth of natural resources: it has some of the world's largest reserves of copper, diamonds, cobalt, and coltan (Van Reybrouck [2014]).

The population belongs to over 200 ethnic groups. In addition, there exist close affinities between ethnic groups and groups in adjoining countries: as a result, developments in Congo are closely connected to those in neighboring countries such as Rwanda and Uganda. There exist enmities between these groups and these ties are an important aspect of the great war in Congo (1996-1997, 1998-2003). For a study of the role of linkages in shaping war, see König et al. [2017] and Goyal [2023]. In view of the many (large and small) groups and the deep enmities between them, we would expect access to be limited. Our theory predicts that tax-rate in Congo will be small. In line with this prediction, the tax to GDP ratio in Congo for the year 2019 was low, at 7.5% (https://www.oecd.org/tax/tax-policy/).[21] The state has failed to provide public goods and basic governance.

[21] For a study of how collaboration with local communities can help is raising taxes in Congo, see Balan et al. [2022] and De Herdt and Titeca [2019].

2. We next take up the *bottom-left* cell in Table 1: groups are small and bridging capital is high. The theory predicts that these are the ideal circumstances for high tax rates. These conditions describe WEIRD societies such as United States, Australia, New Zealand and most of North Western Europe (see Tocqueville [2004], Putnam et al. [1993]). Much has been written about these countries: of the limited scope of kinship groups, of the individualist psychology of their people, and of the strength of out-in-group ties (see Henrich [2020]). In line with our theory, in these countries the tax to GDP ratio is above 20% and for some of these countries it is over 45% (see Table 3).

3. Consider next the *bottom-right* cell in Table 1: groups are small and bridging capital is weak. The theory predicts that tax rates will be modest. We use this cell to understand the experience of Russia.

   In Russia (and in other former communist countries in Eastern Europe) kin-based groups are weak and bridging capital is also weak. This is partly due to its pre-communist history, but it is also because, over its long period of rule, from 1917 to 1990, the communist party actively sought to eliminate political opposition and restrict associational life (Putnam, Leonardi, and Nanetti [1993] and Fukuyama [1995a]). The following lines may turn out to be prescient.

   Many of the formerly Communist societies had weak civic traditions before the advent of Communism, and totalitarian rule abused even that limited stock of social capital. Without norms of reciprocity and networks of civic engagement, the Hobbesian outcome of the Mezzogiorno – amoral familism, clientelism, lawlessness, ineffective government, and economic stagnation seems likelier than successful democratization and economic development. Palermo may represent the future of Moscow. Putnam, Leonardi, and Nanetti [1993], page 183.

   Attempts to contain civic associations have continued after the fall of communism; for an overview of these developments, see Snegovaya [2015]. In line with our theory, Table 3 tells us that the tax-to-GDP ratio of Russia is modest (around 20%) in recent years.[22]

4. The *top-left* cell in Table 1 corresponds to the case of large groups and modest ties. This can perhaps be illustrated with a discussion of South Korea. We draw on Kohli [2004] in our discussion of the South Korean experience. After the Korean

[22] The tax to GDP ratio has historically been low (it was low before large scale oil commenced in the 1960's.)

war, South Korea was characterized by cohesive politics, that is, by centralized and purposive authority structures that penetrate deep into the society. One of the roots of this deep penetration of the state into society was Japanese occupation - Japan had experience in state directed development. In view of the war and the recent experience of colonization, the state in Korea equated rapid economic growth with national security. The state carved out a number of identifiable links with society's major economic groups. Especially notable among the social links was a close alliance between the state and producer or capitalist groups. An important corollary of this political arrangement is a tight control over labor. As a result, politics in Korea was repressive and authoritarian, with leaders often using ideological mobilization (e.g., nationalism and/or anticommunism) to win acceptance in the society. The state in South Korea under Park Chung Hee proved to be a successful agent to lead industrialization.

Mean vs Median Access: We start by noting that we do not have data on bridging ties at a level of granularity that allows us to distinguish between median access and the mean access. That discussion must therefore be left for future work. In this section, we discuss at a high level the situation in a number of countries and we relate that to political tensions in these countries.[23]

Consider the case where median is *smaller* than the mean degree. One instance of such a situation is a society composed of a few small groups that are well connected, while most of the groups are very poorly connected. A prominent example of this is a settler society in which the colonising groups are small but well-connected, while the vast majority of the population is constituted of indigenous groups and these groups have limited bridging ties. Examples of such societies include Zimbabwe and South Africa and a number of Latin American countries. In this setting, the corollary says that the utilitarian tax rate and infrastructures is larger than that chosen by a democratic society. This difference grows with the divergence between median and mean access. This in turn has implications for the scale of state and the nature of private economic activity: in the democratic society the state will be mostly concerned with pure public goods. The utilitarian optimal may entail significant cross-group exchange, whereas the democratic society might support minimal cross-group exchange. A further corollary concerns welfare: as the gap between mean and median degree grows, there will be increasing pressure on the democratic regime.

[23]Mutatis mutandis, everything we say here can also be applies to the divergence between the utilitarian and the authoritarian outcome. In the latter case, the government will choose to maximize the utility of the group in power, who may or may not be the group with the median access.

To elaborate on these observations, we first take up the case of South Africa (and contrast it with Brazil). Our discussion draws heavily on Lieberman [2003]. Direct income taxation is an attractive source of revenue income because it is equitable. However, the empirical record of direct taxes is mixed: in some countries, virtually no revenue is collected, while in others a small amount of income tax revenue has been collected. Only in a few developing countries is income tax collected effectively and efficiently. A comparison of Brazil and South Africa is instructive: by the 1990's Brazil collected about 5 percent of GDP; South Africa on the other hand collected close to 15 percent of its GDP in incomes taxes. What is the reason for such big differences in tax regimes?

By way of background, it is useful to note that until the 1990's the two countries have similar levels of per capita income and similar levels of industrial development and the size of the state was relatively large when compared with other upper middle-income countries. The two countries are also very unequal in their income distribution and these inequalities have traditionally been associated with racial differences. Both countries also share a legacy of colonialism and slavery. Lieberman [2003] makes use of the notion of the National Political Community: this is the official, state-sponsored definition of the nation, which is specified in constitutions or other key policy documents during critical moments of political change. He argues that historically constructed definitions of National Political Community (NPC) were different in South Africa and Brazil. The explicit form of exclusion that was embodied in South Africa's institutionalized white supremacy ultimately legitimated the state in the eyes of white-owned firms and high-income individuals. This facilitated strong cross-language and cross-class ties and supported a set of integrated direct tax policies that remain to this day. By contrast, in Brazil, class relations unfolded in almost the exactly opposite manner. The federal constitution helped make regional identities politically salient, and the virtually all-white upper class groups came to see their interests as more competitive than as shared. No business organization developed that could articulate a truly national set of business or class interests. A sense of ethno-regional heterogeneity remained a source of deep division among upper-class groups in Brazil.

In Zimbabwe there is a very small minority of white settlers, but an overwhelming majority of the population is black African. At independence, in 1980, Zimbabwe was a relatively prosperous but an unequal country. In the initial years, the new government focused on expanding education and health services (that is consistent with our theoretical predictions on pure public goods in the presence of limited access). However, gradually, pressures toward redistribution grew and led to large scale migration of the white minority. Over time, as the economy shrank and pressures grew for greater redistribution, institutions were undermined. This brought about further deterioration in the economy.

We next comment on two countries in Latin America. In Mexico, the people of mixed indigenous and European ancestry â€“ Mestizos â€“ constitute around 60% of the population, indigenous people constitute around 8-10%, and a significant fraction of the rest of the population identifies itself as being European. The country is characterized by extremes of wealth and poverty, with a limited middle class wedged between an elite cadre of landowners and investors on the one hand and masses of rural and urban poor on the other hand (Britannica [2020]). As in India, the indigenous communities have sought greater autonomy as reflected in Zapatistas.

We next discuss Peru. Mestizos constitute 60% of the population, Amerindians constitute 30% of the population, while Europeans (descendants of Spanish colonizers and other Europeans) constitute around 6% of the population. There are also small minorities of Aymara people and people of Japanese ancestry. Economic inequality in Peru overlaps strongly with ethnicity. A small group of people of European ancestry hold power in government and industry, while Spanish-speaking mestizos make up the middle class of Peruvian society, and the indigenous peoples constitute the very poor. As in the other countries we have discussed, in Peru too the indigenous communities have relatively limited social connections (Britannica [2020]).

Historically, in both Mexico and Peru, the state has been controlled by the minority group of European colonists and their successors. Once the countries allowed for voting rights to all adults (1953 in Mexico and 1979 in Peru), strong political pressures for redistribution arose. As a result, these two countries, and other countries in Latin America, have been subject to cycles of populism - riding on a promise of redistribution â€“ interspersed with periods of financial and political crises; for an overview of the Latin American experience, see (Dornbusch and Edwards [2007] and Cárdenas [2010]).[24]

Consider next the case where the median is *larger* than the mean degree. One instance of such a situation is a society where a majority of the population belongs to well connected groups but there also exists a significant minority of the population belonging to groups that are isolated. Examples of such societies include India and the United States: they have relatively large indigenous groups that are relatively isolated

[24]The factors we highlight are broadly consistent with the record of property tax changes across States in the American South over the period 1820-1910. Jensen, Pardelli, and Timmons [2023] present evidence on significant tax rates imposed on the rural elite by themselves and largely spent on expansion of railroads (that largely benefitted the plantation owners, i.e., the rural rich) and they link them to the potential economic advantages accruing to this small group of families.

from each other and from the majority groups (for evidence on favour exchange in rural communities in India and friendships ties in the United States, see Goyal [2023]). In this setting, the corollary suggests that the utilitarian tax revenue is smaller than that chosen by a democratic society. As before, the difference between ideal and realized tax revenue and institutional infrastructure grows with divergence between median and mean degree. The larger tax revenue and infrastructure/institutions support economic activity by the majority while the minority pays for the taxes but does not benefit from it. The democratic outcome entails significant cross-group exchange for the dominant majority, while the rest of the society gets by with mostly within group exchange. Thus there will be large payoff inequality between the well connected majority and the marginalized minority. This inequality creates political tensions and calls for greater redistribution toward groups excluded by the market, which such a society will struggle to meet.

We discuss the case of India here. There is a significant population of tribal groups "these groups are sometimes referred to as Adivasis (original inhabitants), and classified as Scheduled Tribes in official government documents. In 2020, these Scheduled Tribes constituted around 9% of the population – i.e., over a 100 million people. Most of these tribal groups live in relatively remote parts of the country and have limited social ties with other groups (for some evidence on social ties across groups in Indian villages see Goyal [2023]). These tribal groups have been negotiating for political autonomy and economic rights over forests and land for over a hundred years (even before Indian independence from the British). There is a history of these negotiations breaking down and this has given rise to long-lasting insurgencies. The northeastern states of Mizoram, Manipur, and Nagaland are one example of this. However, the tensions between the government and the tribal groups have expanded over time and now cover a large part of Central and south Eastern India, stretching across the states of Jharkhand, Chattisgarh, Odisha, Andra Pradesh and Madhya Pradesh.

The tribal groups are supported by the Communist Party of India (Maoist) and their struggles with the Indian state now constitute one of the largest and most protracted insurgencies in the world. Over the past two decades, more than a 100,000 soldiers have been dispatched to surround the Maoist strongholds in the Centre and the East of India; for a rich and micro-level study of this conflict, see Shah [2019]. In line with our model, spurred on by groups with good access, the Indian state invests in transport infrastructure and contract enforcement. The state also seeks to extend its control over land and forest and mineral resources that were traditionally held by tribal groups. The tribal communities with their limited human capital and minimal access have different priorities. This pressure gives rise to a tension between the state the tribal groups as illustrated by the following quote.

> Even at the cusp of the new millennium, as the world marvelled at India's economic growth rates, there was no provision of electricity or running water, health care or sanitation in any of the villages.... Efforts to encourage literacy were also negligible, and in most of the villages I visited, up to 90% of the Adivasi population were illiterate. Shah [2019], page 31.

B Correlation between Bridging Capital and Tax Rates

We start with data on tax revenue from OECD. We note that the OECD database reports total tax revenue (central, states/regional and local government) as a percentage of GDP. In our study, we wish to cover countries from different parts of the world. We consider all the countries from the World Value Survey about which we also can recover related measures of fractionalization. The list of countries we cover is as follows:

> Argentina, Armenia, Australia, Bangladesh, Brazil, Canada, Chile, China, Columbia, Cyprus, Ecuador, Egypt, France, Germany, Greece, Guatemala, India, Indonesia, Italy, Japan, Kazakhstan, Kenya, Kyrgyzstan, Maldives, Mexico, Mongolia, Morocco, Myanmar, Netherlands, New Zealand, Nigeria, Pakistan, Peru, Philippines, Romania, Russia, Serbia, Singapore, Slovakia, South Africa, South Korea, Thailand, Tunisia, Turkey, UK, Ukraine, Uruguay, US, Vietnam, Zimbabwe .

Table 3 in Appendix presents data on tax/GDP ratio in these countries. We see that there is a very wide range from 0.06 for Nigeria all the way to 0.45 for France and we see that the differences across countries are fairly stable over time. There are many reasons for this great variation in tax to GDP ratios, and group heterogeneities are among them – Alesina, Baqir, and Easterly [1999]. We will control for such group heterogeneities.

Following the large literature on trust in economics and cultural anthropology, we define generalized trust using the following question, Q57, from the World Values Surveys (Glaeser et al. [2000], Henrich [2020]:

> Generally speaking, would you say that most people can be trusted or that you cannot be too careful in dealing with people?

There are two possible responses 1 and 0. Let us define the level of generalized trust as follows:

$$Gen\_Trust = \frac{\text{\# Individuals ``Most People Can be Trusted''}}{\text{\# Individuals answered Q57}}$$

There has been a concern in the literature that generalized references may conflate different aspects of trust: for example, if someone only meets people from within their own isolated community then they may answer 1 to the above question, but this would be misleading as it would only indicate high trust toward own group members and not people in general. To overcome this potential confound, following Henrich [2020] and Enke [2019], we distinguish between different sets of people and examine how much individuals trust (1) their family, (2) their neighbours, (3) people they know, (4) people they don't know, (5) adherents to religions other than their own, (6) foreigners. Let us define in-group trust as average people's responses to the first three categories. Similarly, let us define out-group trust as the average responses to the latter three categories. Let us then define the difference between two averages (standardized by the trust level of the first three group) as a measure of how much individuals trust outsiders as compared to their own group members:

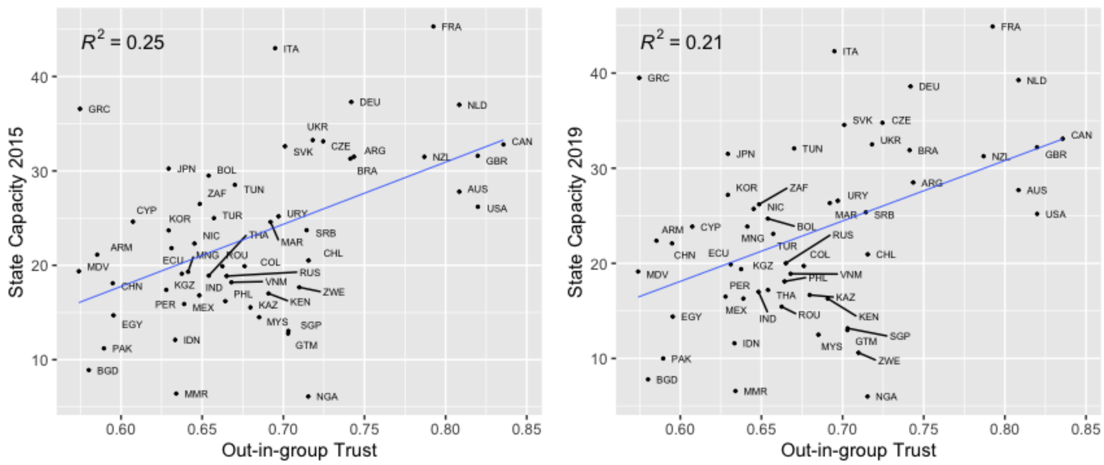
$$Out\_in\_Group\_Trust = 1 + \frac{\text{Out-group Trust} - \text{In-group Trust}}{\text{In-group Trust}}$$

Figure 9 presents a scatter plot for out-in-group trust and aggregate tax to GDP ratio, for two years 2015 and 2019. We see that the correlation is positive and that the R^2 is given by 0.25 and 0.21, respectively, for the years 2015 and 2019.

Let us examine the relationship between out-in-group trust and tax/GDP ratio more closely. We note that generalized trust is potentially correlated with out-in-group trust so we would like to ask if out-in-group trust helps explain aggregate tax to GDP ratio after we control for generalized trust. A second remark is motivated by the two elements of social structure in our model – group partitions and bridging capital. Following the large literature on fractionalization we would like to ask how much does out-in-group trust correlate with tax/gdp ratio, once we control for group partitions.[25]

Recall from Alesina, Devleeschauwer, Easterly, Kurlat, and Wacziarg [2003] that measure of ethno-linguistic fractionalization (ELF) is defined as the probability two ran-

[25]Other important correlations could be explored, using the data in Cappelen, Enke and Tungodden (2024).



(a) 2015 (b) 2019

Figure 9: Scatter Plots: Out-In Group Trust vs Tax/GDP

domly selected individuals belong to different groups. Formally, the ethnic fragmentation index of country j is defined as follows:

$$Ethnic_j = 1 - \sum_{i=1}^{N} s_{ij}^2$$

where s_{ij} is the share of group i ($i = 1 \cdots N$) in country j. Table 4 in the Appendix presents the fragmentation measures for our list of countries based.

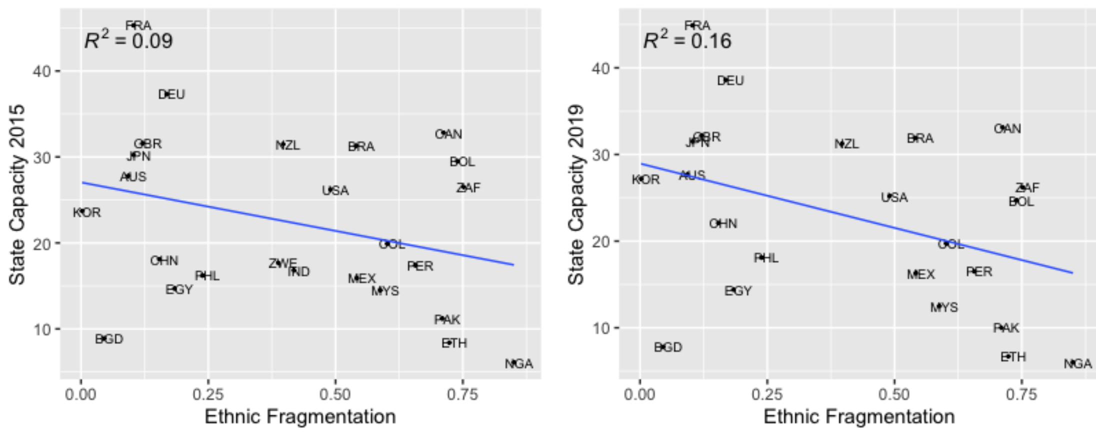
To develop a feel for the data, Figure 10 presents a scatter plot on the relation between ethnic diversity and aggregate tax/GDP ratio. The negative relation is consistent with the well known results of Alesina, Baqir, and Easterly [1999] on public good provision in American cities. We next turn to a statistical study of the relative impact of out-in-group trust, generalized trust and fragmentation on aggregate tax revenue.

Table 2 presents the results of our OLS regression. Model 1 regresses Tax/GDP ratio in 2019 against Out-in Group Trust

$$t2019_i = Out\_in\_group\_Trust_i + \epsilon_i$$

Model2 is a panel data regression of Tax/GDP ratio in 2015 to 2021 against Out-in Group Trust, controlling for generalized trust.

$$t2019_i = Out\_in\_group\_Trust_i + Gen\_Trust_i + \epsilon_i$$



(a) 2015 (b) 2019

Figure 10: Scatter Plots: Ethnic fragmentation vs Tax/GDP

Model3 is a panel data regression of Tax/GDP ratio in 2015 to 2021 against Out-in Group Trust, controlling for ethnic fragmentation and population.

$$t2019_i = Out\_in\_group\_Trust_i + Ethnic_i + \epsilon_i$$

Model 4 regresses Tax/GDP ratio in 2019 against Out-in Group Trust, controlling for general trust, ethnic fragmentation and population.

$$t2019_i = Out\_in\_group\_Trust_i + Gen\_Trust_i + Ethnic_i + Population2015_i + \epsilon_i$$

The coefficient for out-in-group trust is positive and large and statistically significant at the 1% level, the coefficient for generalized trust in not statistically significant, and the coefficient for ethnic fragmentation is negative and statistically significant at the 1% level (our results on the negative impact of ethnic fragmentation are consistent with the findings of Alesina, Baqir, and Easterly [1999]). We obtain similar estimates of coefficients for other years.

Table 3: Tax/GDP (Data Source: OECD, IMF)

Country/Year	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Argentina	31.5	30.7	30	28.5	28.5	29.8	29.1
Armenia	21.1	21.3	20.8	20.9	22.4	22.4	22.7
Australia	27.8	27.5	28.5	28.6	27.7	28.5	30
Bangladesh	8.9	8.7	8.9	8.5	7.8	8.8	7.6

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Table 3 – *Continued from previous page*

Country/Year	2015	2016	2017	2018	2019	2020	2021
Bolivia	29.5	27.9	25.9	25	24.7	22.2	22.6
Brazil	31.3	31.6	31.7	32	31.9	31	33.5
Canada	32.8	33.3	33	33.5	33.1	34.3	33.2
Chile	20.5	20.2	20.2	21.3	21	19.4	22.2
China	18.1	17.5	17.4	17	22.1	20.1	22.3
Colombia	19.9	19.1	19	19.3	19.7	18.8	19.5
Cyprus	24.6	23.9	24.3	24.4	23.9	23.1	25.1
Czechia	33.1	34	34.4	35	34.8	34.7	33.8
Ecuador	21.8	19.9	20.2	21.1	19.9	18.7	19.4
Egypt	14.7	14.5	15.3	15	14.4	13.3	NA
France	45.3	45.4	46.1	45.9	44.9	45.3	45.1
Germany	37.3	37.8	37.7	38.5	38.6	37.9	39.5
Greece	36.6	38.9	39.4	40	39.5	38.9	39
Guatemala	12.8	13.2	13.2	13.2	13	12.4	14.2
India	16.8	17.2	17.6	17	17	16.2	17.6
Indonesia	12.1	12	11.6	12	11.6	10.1	10.9
Italy	43	42.2	41.9	41.7	42.3	42.7	43.3
Japan	30.2	30.3	30.9	31.5	31.5	33.2	30.3
Kazakhstan	15.5	14.9	16	17	16.7	14.1	15.6
Kenya	17	17.2	17.5	16.6	16.3	15.8	15.2
Kyrgyzstan	19.1	19.5	19.3	20.3	19.4	17.4	20
Malaysia	14.5	14	13.4	12.5	12.5	11.4	11.8
Maldives	19.4	19.7	20.1	19.4	19.1	19.1	17.7
Mexico	15.9	16.6	16.1	16.1	16.3	17.8	16.7
Mongolia	19.3	19.1	21.4	23.9	23.9	21	24
Morocco	24.6	25.4	25.9	26.2	26.3	27.3	27.1
Myanmar	6.4	7.8	6.7	3	6.6	NA	NA
Netherlands	37	38.4	38.7	38.8	39.3	40	39.7
NewZealand	31.5	31.4	31.3	32.2	31.3	33.8	33.8
Nicaragua	22.3	23.3	23.8	23.2	25.7	25.4	27.1
Nigeria	6.1	5.3	5.7	6.3	6	5.5	NA
Pakistan	11.2	11.2	11.4	10.2	10	10.3	10.3
Peru	17.4	16.1	15.2	16.3	16.5	15.2	17.9

Continued on next page

Table 3 – *Continued from previous page*

Country/Year	2015	2016	2017	2018	2019	2020	2021
Philippines	16.2	16.2	16.8	17.4	18.1	17.8	18.1
Romania	19.9	17.8	16.4	15.3	15.4	15.1	15.9
Russia	18.9	18	19.2	20.5	20	19.4	21.6
Serbia	23.7	24.7	25.4	25	25.4	24.8	25.7
Singapore	13	13	13.8	12.9	13.2	12.6	12.6
Slovakia	32.6	33.2	34.1	34.2	34.6	35.2	35.8
SouthAfrica	26.5	26.1	26.1	26.6	26.2	25.2	27.8
SouthKorea	23.7	24.7	25.4	26.7	27.2	27.7	29.9
Thailand	18.9	18.1	17.5	17.7	17.2	16.5	16.4
Tunisia	28.5	27.9	29.2	29.9	32.1	32.5	32.5
Turkey	25	25.1	24.7	24	23.1	23.9	22.8
UK	31.6	32.2	32.5	32.4	32.2	32.1	33.5
US	26.2	25.9	26.8	24.9	25.2	25.8	26.6
Ukraine	33.3	30.9	32.2	33	32.5	32.6	31.4
Uruguay	25.2	25.6	26.9	27	26.6	26.7	26.5
Vietnam	18.2	18.4	18.4	18.3	18.9	17.7	18.2
Zimbabwe	17.7	15.3	12.8	11.7	10.6	12.8	14.9

Table 4: Fractionalisation(Source: Alesina et al (2003))

Country	year_frac	Ethnic	Language	Religion
Argentina	1986	0.255	0.0618	0.2236
Armenia	1989	0.1272	0.1291	0.4576
Australia	1986	0.0929	0.3349	0.8211
Bangladesh	1997	0.0454	0.0925	0.209
Bolivia	1998	0.7396	0.224	0.2085
Brazil	1995	0.5408	0.0468	0.6054
Canada	1991	0.7124	0.5772	0.6958
Chile	1992	0.1861	0.1871	0.3841
China	1990	0.1538	0.1327	0.6643
Colombia	1985	0.6014	0.0193	0.1478
Cyprus	1992	0.0939	0.3962	0.3962

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Table 4 – *Continued from previous page*

Country	year_frac	Ethnic	Language	Religion
Czechia	1991	0.3222	0.3233	0.6591
Ecuador	1989	0.655	0.1308	0.1417
Egypt	1998	0.1836	0.0237	0.1979
France	1999	0.1032	0.1221	0.4029
Germany	1997	0.1682	0.1642	0.6571
Greece	1998	0.1576	0.03	0.153
Guatemala	2001	0.5122	0.4586	0.3753
India	2000	0.4182	0.8069	0.326
Indonesia	1990	0.7351	0.768	0.234
Italy	1983	0.1145	0.1147	0.3027
Japan	1999	0.0119	0.0178	0.5406
Kazakhstan	1999	0.6171	0.6621	0.5898
Kenya	2001	0.8588	0.886	0.7765
Kyrgyzstan	2001	0.6752	0.5949	0.447
Malaysia	1996	0.588	0.597	0.6657
Maldives		NA	NA	NA
Mexico	1990	0.5418	0.1511	0.1796
Mongolia	1989	0.3682	0.3734	0.0799
Morocco	1994	0.4841	0.4683	0.0035
Myanmar	1983	0.5062	0.5072	0.1974
Netherlands	1995	0.1054	0.5143	0.7222
NewZealand	1996	0.3968	0.1657	0.811
Nicaragua	1991	0.4844	0.0473	0.429
Nigeria	1983	0.8505	0.8503	0.7421
Pakistan	1995	0.7098	0.719	0.3848
Peru	1981	0.6566	0.3358	0.1988
Philippines	1998	0.2385	0.836	0.3056
Romania	1998	0.3069	0.1723	0.2373
Russia	1997	0.2452	0.2485	0.4398
Serbia	1991	0.5736	NA	NA
Singapore	2001	0.3857	0.3835	0.6561
Slovakia	1996	0.2539	0.2551	0.5655
SouthAfrica	1998	0.7517	0.8652	0.8603

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Table 4 – *Continued from previous page*

Country	year_frac	Ethnic	Language	Religion
SouthKorea	1990	0.002	0.0021	0.6604
Thailand	1983	0.6338	0.6344	0.0994
Tunisia	2001	0.0394	0.0124	0.0104
Turkey	2001	0.32	0.2216	0.0049
UK	1994	0.1211	0.0532	0.6944
US	2000	0.4901	0.2514	0.8241
Ukraine	1998	0.4737	0.4741	0.6157
Uruguay	1990	0.2504	0.0817	0.3548
Vietnam	1995	0.2383	0.2377	0.508
Zimbabwe	1998	0.3874	0.4472	0.7363

Table 2: Tax/GDP and Out-In-Group Trust(All Countries)

	Dependent variable:			
	t2019			
	(1)	(2)	(3)	(4)
Out_In_Group_Trust	61.722***	43.954**	60.282***	54.219***
	(17.666)	(20.004)	(16.032)	(19.019)
Gen_Trust		14.763*		4.916
		(8.361)		(8.152)
Ethnic			−17.234***	−16.254***
			(4.370)	(4.691)
Constant	−18.483	−9.727	−10.857	−8.210
	(12.122)	(12.858)	(11.231)	(12.132)
Observations	50	50	49	49
R^2	0.203	0.252	0.402	0.407
Adjusted R^2	0.186	0.221	0.376	0.367
Residual Std. Error	8.432 (df = 48)	8.252 (df = 47)	7.441 (df = 46)	7.493 (df = 45)
F Statistic	12.206*** (df = 1; 48)	7.931*** (df = 2; 47)	15.474*** (df = 2; 46)	10.294*** (df = 3; 45)
Note:				*p<0.1; **p<0.05; ***p<0.01