Diversity Taxes*

Saumya Deojain[†] David Lindequist[‡]

Washington University in St. Louis Washington University in St. Louis

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We propose a model in which cultural diversity generates social conflict through negative consumption externalities. These externalities can be mitigated by a government which transforms cultural consumption into public good consumption. We show that in such a framework, 'diversity taxes' arise as a policy tool to regulate the externalities from the cultural consumption of diverse groups. We link the size of such taxes to characteristics of the underlying distribution of cultural groups as well as to the type of government (utilitarian, majority, minority). In contrast to much of the literature, our analysis predicts that more diverse communities have a bigger government size as measured by local taxes per capita. Using U.S. city and county data from 1990, we are able to verify this prediction. We find strong evidence for the existence of sizeable 'diversity taxes' in U.S. localities after controlling for a variety of socioeconomic and demographic indicators. We further document statistically significant relationships between characteristics of the group size distribution and local taxes per capita which are in line with our hypothesized link between cultural diversity, negative externalities, and taxation.

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1 Introduction

The record-breaking volume of migration in the past few years has made the question of how to deal with conflict created by diverse communities a pressing issue for governments all over the world. Elements of this conflict are often embodied in discomfort with differentiated cultural consumption. A Christian may dislike the type of consumption that is specific to Ramadan and a Muslim may dislike the expression of religiosity celebrated during Lent. By framing conflict

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[†]Email: deojain@wustl.edu
[‡]Email: david.lindequist@wustl.edu

between divided groups as negative consumption externalities we study how governments use taxation and public spending to mitigate conflict created by social divisions.

The vast literature on diversity and public policy focuses primarily on how governments allocate public funds in the face of diversity, often modeled as heterogeneous preferences for a public good. In most models, this heterogeneity in preferences leads to an overall smaller size of the government compared to an economy without diverse social groups. We, on the other hand, focus on how public spending and taxation regulate conflict between socially divided groups. In our model, governments use taxes to limit the externalities of consumption created in the cultural sphere, such as celebration of Ramadan and Lent, and invest instead in secular celebrations, such as the 4th of July, which do not create cultural externalities. This implies that even 'unproductive' public spending serves as a tool to mitigate conflict within diverse societies. In contrast to much of the literature, we conclude that more diversity leads to a bigger size of the government.

We contribute to the theoretical analysis of diversity and public policy in two important ways. First, we distinguish government types by the way different groups are prioritized in public policy decision making. This generalization allows us to explain how changes in diversity influence public policy outcomes. For example, our model predicts that a government which favors the majority cultural group increases taxes when diversity increases, while a government that favors the minority may increase or decrease taxes in response to an increase in diversity. The flexibility of social weights that define 'government types' allows us to analyze the interplay between diversity and specific political processes such as majority voting where social weights are endogenized. According to our model, when there is majority voting and the majority group includes the median voter, public policy is aimed at reducing the externalities faced by the majority group. From this analysis we derive predictions about the relationship between taxation and public spending for different levels of diversity. We test these predictions using U.S. city and county data on ethnic diversity from 1990 provided in Alesina et al. [1999]. We find significant evidence for the existence of sizeable 'diversity taxes'. Controlling for a variety of socioeconomic indicators, we document that the average U.S. city in 1990 would have experienced a decrease in local taxes per capita if nearly 16% if the population had been completely homogenized. These results are qualitatively robust to an instrumental variable approach controlling for potential endogeneity.

Our second theoretical contribution is to disentangle the impact of different dimensions of diversity on government regulation of social conflict. In the literature on ethnic diversity, polarization and fractionalization indices are commonly used to measure diversity. We incorporate these measure into our model by distinguishing increases in diversity due to the increasing size of an already existing group (intensive margin) and due to the addition of a new group (extensive margin). While fractionalization increases both at the extensive and the intensive margin, polarization increases at the intensive margin and decreases at the extensive margin. This theoretical distinction allows us to study the impact of finer definitions of diversity on public policy. To further explore our proposed channel from diversity to public policy in the data, we test the predictions of our model along the intensive margin of diversity by exploring how diversity within the minority affects regulation. Our model predicts that more ethnic fractionalization of the minority group increases the total externalities imposed on the majority group which induces the majority group to impose higher local taxes. This prediction is confirmed in the data. Ethnic fractionalization of the minority group significantly and positively influences taxes per capita within U.S. cities in 1990. This finding corroborates our hypothesized link between cultural diversity and public policy through negative consumption externalities.

In our theoretical setup, the main mechanism that increases taxes is an increase in the externalities imposed on a prioritized group. These externalities can be increased in two ways. One way is if groups increase in size. Bigger groups create larger externalities on other groups. A more subtle way is the shift in sizes of the groups creating externalities on the prioritized group. Consider an increase in diversity that keeps the size of the prioritized group the same but fragments the other groups. In our model, smaller groups create more externalities per capita but less externalities in total, i.e. total cultural consumption of a group is concave in its size. So even if the group that creates the largest externality becomes smaller due to fragmentation, the increase in the size of the smaller groups increases the overall externalities faced by the prioritized group. This effect is most pronounced when one considers a government that favors a minority group. When diversity increases at the intensive margin, the size of the majority reduces. However, the increase in the size of minority groups results in an overall increase in externalities. This induces minority governments to increase taxes when diversity is increasing. Another implication of the concavity of cultural good consumption is that when governments favor a majority, a more fragmented minority creates more externalities than a big minority. We find strong evidence for this impact of minorty fragmentation in the data where an increase in ethnic fractionalization of the minority increases taxes per capita significantly after controlling for the size of the majority. This theoretical prediction and the suggestive evidence we find in the data for more social conflict as a result of smaller minorities adds a novel aspect to the literature on the relationship between ethnic polarization, conflict and public policy.

The rest of this paper is organized as follows. Section 1.1 contrasts our setup and findings to the literature on diversity, public policy, and conflict. Section 2 presents our theoretical model which we use to study the relationship between diversity, government type, and taxation. In this section, 2.1 sets up the model and 2.2 establishes and discusses the key results of the theoretical analysis. In 2.3, we discuss the inclusion of a political process like majority voting. We further discuss the relationship between majority voting government regulation and a fragmented minority. Section 3 modifies our general model to derive predictions which we test using U.S. city and county data. In this section, we discuss multiple robustness checks and address potential endogeneity concerns. Section 4 concludes.

1.1 Related Literature

There is a large literature on the effect of diversity on public spending and public good provision. Stichnoth and Van der Straeten [2013] provide a comprehensive survey of recent empirical work that illustrates the complicated evidence of the impact diversity has on government expenditure and public good provision. However, there is a gap in the literature on the direct effect of diversity on taxes.

As far as the indirect effect is concerned, a lot of the evidence points to a negative relationship between public spending and ethnic diversity. Alesina and Glaeser [2004] and Alesina et al. [2001] discuss how differences in public spending in the US and Europe can be explained by differing levels of ethnic diversity. Specifically, they explore the redistribution channels of public spending and find that the more homogeneous Europe has higher levels of redistribution than the more heterogeneous US. This is attributed to a coordination failure between groups that do not like to share the benefits of redistribution with other groups. We view these results as complimentary to our model as we claim that taxes are imposed on groups in order to control spending on cultural goods that create externalities. The finding of lower levels of redistribution in highly diverse societies strengthens our prediction that cultural good consumption is being more aggressively regulated in diverse countries which reduce disposable income to diverse cultural groups. More specifically, we find that in U.S. city and county data from 1990, diversity has no significant effect on public welfare spending.

The political economy of public good provision and diversity remains contested. When diversity is negatively correlated with public good provision (Alesina et al. [1999], Hopkins [2009], Spolaore and Wacziarg [2017], Alesina et al. [2019]), it has been attributed to coordination failures due to heterogenous public good preferences. When diversity has been positively correlated to public good provision (Gisselquist et al. [2016], Gisselquist [2014], Banerjee and Somanathan [2007]), it has been attributed to 'diversity dividends' that arise when politically competing social groups keep each other in check for the provision of public goods. We remain neutral about these findings as our results do not depend on the public good provided per se. While our model incorporates secular good provision, it is not central to our analysis. We also do not find any conclusive evidence about the effect of diversity on public good provision like education and hospitals. Our findings highlight that if public goods are a means to reduce conflict between divided groups, then the provision of public goods increases with diversity as we find in this paper. This finding, however, does not contradict the notion that if public goods are solely a productive public good, then miscoordination within a society can result in a negative relationship between diversity and public good provision as other authors have argued (Alesina et al. [2019]). Hence, we see our findings as complementary to the findings by previous work about the relationship between public good provision and diversity. The main contribution of our paper is to introduce the concept of 'diversity taxes' imposed by governments to regulate consumption externalities created between groups. We find strong evidence in the data for this hypothesis.

Measuring diversity has also been a contentious issue when using it as an indicator for conflict (Somanathan [2018]). This is because diversity has several dimension that can affect conflict and coordination between groups. Esteban et al. [2010] have shown that polarization, a proxy for group competition, may be a better measurement of ethnic friction than ethnic fractionalization which solely measures the relative sizes of groups. We incorporate these distinctions in our empirical analysis and are able to predict the effect of these different measurements on taxes. A contribution of our paper is to identify the effects of finer definitions of diversity, such as the size of the majority group and fractionalization within the minority, on public policy outcomes such as taxes.

Theoretical papers such as Fernández and Levy [2008] and Ghosh and Mitra [2016] try to explain the political economy of diversity, public spending and ethnic good provision by directly constraining the political process. Fernández and Levy [2008] use an endogenous party formation explanation, while Ghosh and Mitra [2016] explain how dictatorships and democracies differ in their provision of ethnic goods and redistributive transfers. Our paper departs from these papers as we assume that the government can control the consumption of cultural goods through individuals' disposable income. This collapses an otherwise multi-dimensional policy decision to a one-dimensional decision about a tax rate. This abstraction is in line with the idea that governments can mitigate cultural conflict through instruments that only roughly translate a multi-dimensional preference space into optimal policy. Furthermore, this constrains government expenditure decisions in a way that allows more degrees of freedom for the type of governments and political processes.

2 Model

This section sets up and discusses the results of the model for government taxation of cultural consumption externalities. The setup is discussed in section 2.1 and the main results for the relationship between different types of diversity and the government type are discussed in section 2.2. In that section, we discuss how we interpret diversity changing at the intensive and the extensive margin. We define a government type by the weights it puts on the different groups in the society. By focusing on three government types (majority, minority and utilitarian) we are able to distinguish three different functional forms of the equilibrium government tax. These depend on the types of externalities that enter a government's objective function. Section 2.3 contains further discussion on equilibrium taxes for the political process of majority voting, and minority fragmentation at the intensive margin.

2.1 Setup

The model is a two stage game. In the first stage, the government chooses the tax rate on labor income for the entire economy. In the second stage, agents allocate their post-tax labor income between private and cultural good consumption. The government uses its tax revenue to provide a 'secular' public good. Hence, the relative consumption of private, cultural, and secular goods in the equilibrium of this two-stage game is regulated by the government tax rate.

We consider a continuum of agents in $[0,1]$ where each agent belongs to a social group $i \in M = \{1, 2, ..., m\}$. An agent from group i inelastically supplies one unit of labor to the labor market where he obtains a fixed wage rate w. The government sets a tax rate t which is applied to an agent's labor market income. The agent allocates his post-tax wage income $(1-t)w$ between cultural good consumption, e_i, and private goods consumption, c_i. Cultural good consumption by one group creates negative externalities on agents belonging to other groups. The government can mitigate these externalities by taxing labor market incomes and using the proceeds to provide a secular public good, g. This public good is equally enjoyed by all agents from all groups. The government is restricted to apply the same tax rate to all agents.

The government chooses its tax rate through backward induction. It is constrained by the optimization problem of the agents in a social group and a budget constraint for the expenditure on the secular good, g. We present the second stage first.

Second Stage: Cultural Group Optimization Problem

An agent from group i has the following utility function[1]

$$u^i(E_i, E_{-i}, c_i, g) = \alpha \ln E_i + \beta \ln c_i + \gamma \ln g - \sum_{j \neq i} E_j \tag{2}$$

with $\alpha, \beta, \gamma > 0$ and $\alpha + \beta + \gamma = 1$. $E_i = \phi_i e_i$ is the total cultural good consumption by group $i \in M$ where $\phi_i \in (0,1)$ is the size of group i, c_i is the private good consumption by an individual in group i, and $E_{-i} = \sum\limits_{j \neq i} E_j$ is the total amount of negative externalities imposed on group i. This specification of the utility function captures two types of externalities between agents in this economy. First, there is a negative externality that is created by the

[1]Further generalization of this ultility function to

$$u^i(E_i, E_{-i}, c_i, g) = \alpha \frac{E_i^{1-\theta}}{1-\theta} + \beta \frac{c^{1-\eta}}{1-\eta} + \gamma \frac{g^{1-\nu}}{1-\nu} - \delta \frac{\{\sum\limits_{j \neq i} E_j\}^{1+\mu}}{1+\mu} \tag{1}$$

leads to similar qualitative results for the relationship between taxes and the different types of diversity. However, because this general expression does not allow for closed form solutions for t, we are unable to make clean comparisons between equilibrium taxes of different governments and explore the effect of different types of diversity on taxes. Similarly, introducing a labor supply choice leads to the same qualitative results, but makes the model less tractable.

exposure to the cultural good consumption of other groups. Second, there is positive externality created by same-group members who all contribute to their common cultural good consumption.

For a given tax rate t, agents optimize their cultural and private good consumption facing the following budget constraint:

$$e_i + c_i = w(1-t) \tag{3}$$

Thus, the optimization problem for the agent in group i is given by:

$$\left.\begin{array}{ll} \max\limits_{c_i, e_i} & u^i(E_i, E_{-i}, c_i, g) \\ s.t. & e_i + c_i = w(1-t) \end{array}\right\} C_i \tag{4}$$

The c_i^* and e_i^* that solve C_i will be functions of the exogenous variables w, $\boldsymbol{\phi}_m = (\phi_1, ..., \phi_m)$, and the tax rate, t, set by the government. As $\boldsymbol{\phi}_m$ is the distribution vector of group sizes, it holds that $\sum\limits_{i \in M} \phi_i = 1$.

First Stage: Government Optimization Problem

Through backward induction the government sets a tax rate which maximizes its objective function. A government's objective function depends on the social weights it puts on the different cultural groups given by vector $\boldsymbol{\lambda}_m = (\lambda_1, ..., \lambda_m)$ and the size of each group given by the distribution vector $\boldsymbol{\phi}_m$. The government's budget constraint is given by:

$$g = wt \tag{5}$$

The government maximizes its objective function based on the consumption decisions $c_i^*(t)$ and $e_i^*(t)$ of agents in each cultural group. Any government at $\boldsymbol{\phi}_m$ defined by $\boldsymbol{\lambda}_m$ solves the following optimization problem:

$$\left.\begin{array}{lll} \max\limits_{t} & & U_{\boldsymbol{\lambda}_m}(\boldsymbol{\phi}_m) = \sum\limits_{i \in M} \lambda_i \phi_i u^i(.) \\ s.t. & & g = tw \\ and & & \forall i \in M \quad c_i^*(t), e_i^*(t) \text{solve} \\ & & \left.\begin{array}{ll} \max\limits_{c_i, e_i} & u^i(.) \\ s.t. & c_i + e_i = w(1-t) \end{array}\right\} C_i \end{array}\right\} G_{\boldsymbol{\lambda}_m \boldsymbol{\phi}_m}$$

where $\boldsymbol{\lambda}_m$ is normalized such that $\sum_{i \in M} \lambda_i = 1$.

2.2 Results

Second stage solution:

Solving for C_i for each agent in group $i \in M$ gives the solutions for private good consumption, $c_i^*(t)$, and cultural good consumption, $e_i^*(t)$. We obtain

$$c_i^*(t) = w(1-t)\Big[\frac{\phi_i \beta}{(\alpha + \beta\phi_i)}\Big] \tag{6}$$

$$e_i^*(t) = w(1-t)\Big[\frac{\alpha}{(\alpha + \beta\phi_i)}\Big] \tag{7}$$

$$E_i^*(t) = w(1-t)\Big[\frac{\phi_i \alpha}{(\alpha + \beta\phi_i)}\Big] \tag{8}$$

and

$$E_{-i} = \sum_{j \neq i} E_j = w(1-t)\sum_{j \neq i}\Big[\frac{\alpha\phi_j}{(\alpha + \beta\phi_j)}\Big] \tag{9}$$

Note that the total cultural good consumption by group i, $E_i^*(t)$, as well as private good consumption per capita, $c_i^*(t)$, are increasing and concave in group size. The concavity of total cultural consumption in group size implies that negative externalities increase by a larger amount when smaller groups become bigger compared to already large groups becoming even larger.

Governments can reduce consumption externalities created in the economy by increasing t. They prioritize the externalities imposed on different groups based on the social weights they apply to each group.

First stage solution: equilibrium government tax rate

Using the solutions from the maximization problem at the group level to solve $G_{\boldsymbol{\lambda}_m \boldsymbol{\phi}_m}$, we get a closed form solution for the equilibrium tax rate, $t^*_{\boldsymbol{\lambda}_m}(\boldsymbol{\phi}_m)$.

Lemma 1. *For a given number of groups m and size distribution over groups, $\boldsymbol{\phi}_m = (\phi_1, ..., \phi_m)$, the sub-game perfect equilibrium tax rate set by the government that sets social weight distribution $\boldsymbol{\lambda}_m = (\lambda_1, ..., \lambda_m)$ over groups is given by*

$$t^*_{\boldsymbol{\lambda}_m}(\boldsymbol{\phi}_m) = \frac{1}{2} - \frac{1}{2\Omega} + \sqrt{\left(\frac{1}{2\Omega} - \frac{1}{2}\right)^2 + \frac{\gamma}{\Omega}} \tag{10}$$

where

$$\Omega_{\boldsymbol{\lambda}_m}(\boldsymbol{\phi}_m) \equiv \frac{\alpha w \sum_{i \in M} \lambda_i \phi_i \left(\sum_{j \neq i} \frac{\phi_j}{\alpha + \beta\phi_j}\right)}{\sum_{i \in M} \lambda_i \phi_i} \tag{11}$$

with $\Omega_{\boldsymbol{\lambda}_m}(\boldsymbol{\phi}_m) > 0$.

Proof. All proofs are in the Appendix. □

Lemma 1 tells us that the relationship between the equilibrium tax rate and diversity ($\boldsymbol{\phi}_m$) and government ($\boldsymbol{\lambda}_m$) parameters is fully described by the variable $\Omega_{\boldsymbol{\lambda}_m}(\boldsymbol{\phi}_m)$. $\Omega_{\boldsymbol{\lambda}_m}(\boldsymbol{\phi}_m)$ turns out to be a meaningful variable in our formulation. It is the *ratio between the total welfare gain from increasing taxes*, through reduction of total externalities, *and the total welfare loss of increasing taxes*, through the reduction of consumption of own-cultural goods. We call $\Omega_{\boldsymbol{\lambda}_m}(\boldsymbol{\phi}_m)$ the *government benefit to loss ratio of cultural regulation.* Note that when $\phi_i = 1$, i.e. when there is only one group in the economy, then $\Omega = 0$ as there are no negative externalities created. This implies that $t = \gamma$, i.e. the tax rate is only influenced by the relative preference for the secular good. If $\phi_i \in (0,1)$ for any given $\boldsymbol{\phi}_m$, i.e. when there are other groups in the economy, then $\Omega > 0$, and the tax rate chosen by the government is a function of the preference for the public good and the negative externalities imposed on the groups the government cares about. This implies that the presence of negative consumption externalities increases tax rates compared to a benchmark scenario with no diverse groups. This is our notion of 'diversity taxes'.

The formulation in Lemma 1 allows us to neatly study how the interaction between different dimensions of diversity and the government type impact taxation, all through the variable $\Omega_{\boldsymbol{\lambda}_m}(\boldsymbol{\phi}_m)$.

Corollary 1. *The equilibrium tax rate $t^*_{\boldsymbol{\lambda}_m}(\boldsymbol{\phi}_m)$ is monotonically increasing in $\Omega_{\boldsymbol{\lambda}_m}(\boldsymbol{\phi}_m)$.*

We proceed to define three types of government, at a given $\boldsymbol{\phi}_m$, which have different functional forms of the government benefit to loss ratio of cultural regulation, $\Omega_{\boldsymbol{\lambda}_m}(\boldsymbol{\phi}_m)$. Without loss of generality we assume group 1 is the biggest group in the economy with m groups i.e. $\phi_1 > \frac{1}{m}$.

Definition 1. *For a given m and $\boldsymbol{\phi}_m = (\phi_1, ..., \phi_m)$*

1. *A utilitarian government has an objective function with $\lambda_i = \lambda_j = \frac{1}{m}\ \forall i, j \in M$*
2. *A majority government has an objective function with $\lambda_1 = 1$*
3. *A minority government has an objective function with $\lambda_i = 1$ where $i \neq 1$*

The distribution of $\boldsymbol{\lambda}_m$ characterizes which groups the government cares about. A majority government only prioritizes the majority group which puts all the social weight on its members, the minority government prioritizes only a minority group, and a utilitarian government is controlled by a benevolent dictator prioritizing each agent equally. The groups that are prioritized by the government through $\boldsymbol{\lambda}_m$ determine the externalities that are prioritized by the government when taxes are imposed. This is clear by the changes in the government benefit to loss ratio of cultural regulation, $\Omega_{\boldsymbol{\lambda}_m}(\boldsymbol{\phi}_m)$, for different values of $\boldsymbol{\lambda}_m$.

Corollary 2. *Take as given m and $\boldsymbol{\phi}_m = (\phi_1, ..., \phi_m)$.*

1. *For a utility government, $\Omega_u(\phi) = \alpha w \sum_{i \in M} \phi_i \Big(\sum_{j \neq i} \frac{\phi_j}{\alpha + \beta \phi_j} \Big)$*

2. *For a majority government,* $\Omega_{maj}(\phi) = \alpha w \sum\limits_{j \neq 1} \frac{\phi_j}{\alpha + \beta\phi_j}$.

3. *For a minority government,* $\Omega_{min}(\phi) = \alpha w \sum\limits_{j \neq i} \frac{\phi_j}{\alpha + \beta\phi_j}$ *where* $i \neq 1$

While a utilitarian government regulates the total externalities created in the entire economy, a minority or majority government only regulates the negative externalities which the group that controls them faces.

From our definitions, a majority government focuses solely on the negative externalities on the majority group. As the majority group faces the least cultural externalities among the groups in the economy, a majority government imposes a smaller tax than either the minority group or the utilitarian group. Conversely, the smallest group faces the largest externalities. Hence, a minority government which prioritizes the smallest group's preferences would impose the highest taxes compared to any other minority or majority government. This result is summarized in the following Proposition.

Proposition 1. *For a given* $\boldsymbol{\phi}_m = (\phi_1, ..., \phi_m)$, $t^*_{min}(\boldsymbol{\phi}_m) \geq t^*_u(\boldsymbol{\phi}_m) \geq t^*_{maj}(\boldsymbol{\phi}_m)$.

Here, $t^*_u(\boldsymbol{\phi}_m)$, $t^*_{maj}(\boldsymbol{\phi}_m)$ and $t^*_{min}(\boldsymbol{\phi}_m)$ are the equilibrium tax rates imposed by a utilitarian government, a majoritarian and a minority government respectively for a given distribution of groups $\boldsymbol{\phi}_m$.

Comparative statics of tax rates with respect to diversity

In our model, the distribution vector $\boldsymbol{\phi}_m$ captures two different dimensions of diversity. First, the length of $\boldsymbol{\phi}_m$ describes the number of groups within a society. Second, the elements of $\boldsymbol{\phi}_m$ describe how agents are distributed into different groups. That is, we are able to separate two dimensions of diversity through our distribution vector $\boldsymbol{\phi}_m$. One dimension of change is how agents are distributed between groups for a fixed m. We call this change in diversity a change of diversity at the *intensive margin.* The other dimension of change that we define is at the *extensive margin* where we fix the proportion of one group and allow for the number of groups, m, to increase. We simplify the analysis on these two dimension by imposing the following assumptions on $\boldsymbol{\phi}_m$:

Assumption 1. *For a given* $\boldsymbol{\phi}_m = (\phi_1, ..., \phi_m)$

1. $\phi_1 > \frac{1}{m}$

2. $\phi_j = \frac{1-\phi_1}{m-1} \; \forall \; j \neq 1$

This implies that ϕ_1 is a proxy for the change of diversity along the intensive margin. As group 1 is assumed to be the majority, for a fixed m, an increase in ϕ_1 is a decrease in diversity along the intensive margin. Diversity increases at the extensive margin when we increase m, for a fixed ϕ_1.

Taxation and intensive margin diversity

Higher diversity at the intensive margin means a lower value of ϕ_1 with m being fixed. For a given $\phi_1 > 1/m$, the majority faces lower externalities than the minority group. Hence, total externalities in the society decrease as intensive margin diversity decreases.

Proposition 2. *Let* $\phi_1 > \frac{1}{m}$ *then:*

1. *For the utilitarian government:* $\frac{\partial t_u^*(\phi_1,m)}{\partial \phi_1} < 0$
2. *For the majority government:* $\frac{\partial t_{maj}^*(\phi_1,m)}{\partial \phi_1} < 0$
3. *For the minority government where* $i \neq 1$*. Define* $\underline{m} = 2 + \frac{\alpha^2}{2\alpha\beta+\beta^2}$.
   If $m > \underline{m}$*, then* $\exists \hat{\phi} \equiv \hat{\phi}(m,\alpha,\beta) \in (1/m, 1)$ *such that:*

   For $\phi_1 \in (\frac{1}{m}, \hat{\phi})$*:*
$$\frac{\partial t_{min}^*(\phi_1,m)}{\partial \phi_1} > 0,$$
   For $\phi_1 \in (\hat{\phi}, 1]$*:*
$$\frac{\partial t_{min}^*(\phi_1,m)}{\partial \phi_1} < 0$$
   If $m \leq \underline{m}$*, then*
$$\frac{\partial t_{min}^*(\phi_1,m)}{\partial \phi_1} > 0$$

Proposition 2 gives the full description of how different governments react to changes in diversity at the intensive margin. A utilitarian government which takes into account the total externalities faced by all groups in the society reduces taxes as the majority group's size (ϕ_1) increases. This is because as ϕ_1 increases, externalities faced by the majority group constitute a larger fraction of the total externalities faced by the diverse groups in the society. As the negative externalities on the majority group decline with ϕ_1, this implies that the total amount of negative externalities in the society go down. As a result, the utilitarian government decreases taxes as diversity at the intensive margin decreases, i.e. as ϕ_1 increases.

The negative relationship between taxes and declining diversity at the intensive margin is even more pronounced for a majority government. Such a government only takes into account the negative externalities imposed on the majority group. As these externalities decrease in the majority group size, the majority government decreases taxes when ϕ_1 increases. In doing so, the majority government does not take into account that the majority group imposes negative consumption externalities on the other groups in the society.

There is a more subtle relationship between diversity at the intensive margin and the tax rate chosen by a minority government. While a greater ϕ_1 increases the externality of the majority group on the minority group, it also reduces the externalities created by all the other minority groups. These two effects go in opposite directions. The trade-off between a large externality from a big group and the sum of many small externalities from small groups results in a non-monotonic relationship between taxes and diversity at the intensive margin, ϕ_1, for a minority government if the number of groups is sufficiently large ($m > \underline{m}$). This non-monotonicity is rooted in the concavity of total cultural consumption of a group with respect to its group size. Note that the amount of externalities produced by the the majority group is independent of the number of groups m while the total amount of negative externalities produced by $m-1$ minority groups is increasing in m. This implies that for a large number of groups, the externalities produced by minority groups are high relative to the externalities produced by the majority group. If the majority group is then sufficiently big ($\phi_1 > \hat{\phi}$), an increase in its size decreases the total amount of externalities produced by $m-2$ minority groups more than the increase in the majority group's size increases them (due to the concavity of cultural good consumption). As a result, a minority government would decrease taxes if an already big majority group gets even bigger. On the other hand, if the majority group is not too big ($\phi_1 \leq \hat{\phi}_1$), an increase in the majority group's size increases total externalities more than the reduction in minority group size decreases them. This implies that the minority government increases taxes as ϕ_1 increases. This non-monotonic relationship vanishes if the number of groups is relatively small ($m \leq \underline{m}$). Then the decrease in negative externalities from a shrinking of minority groups is always outweighed by the increase in negative externalities from an increasing majority group. As a result, the minority government increases taxes in response to an increase in the majority group's size if $m < \underline{m}$.

Taxation and extensive margin diversity

At the extensive margin, diversity increases as the number of groups, m, increases while holding ϕ_1 constant. When an additional small group comes into the society, we find that it increases externalities across the board for all the already existing groups. This is why taxes increase independent of the initial social weights on groups.

Proposition 3. *Given $\boldsymbol{\lambda}_{m+1} = (\lambda_1, ..., \lambda_m, \lambda_{m+1})$ and ϕ_1, assuming $\lambda_{m+1} = 0$,*

$$\frac{\Delta t^*_{\boldsymbol{\lambda}_{m+1}}(\phi_1, m)}{\Delta m} > 0$$

Proposition 3 implies that all types of governments that existed before the creation of a new group will increase taxes with the introduction of this new group. While a new group results in smaller minority groups, it increases the total amount externalities imposed on all the old groups. This result is driven by the concavity of a group's consumption of a cultural good. The introduction of a new group reduces the size of existing smaller groups which makes them consume less of their cultural good as a group, but more of their own cultural goods per capita. This implies that the decrease in total externalities from existing groups is smaller than the increase in externalities from the newly added group. As a result, all existing groups face more total negative externalities when a new group is introduced. This results in higher taxes irrespective of the existing social weights.

2.3 Extensions

In this section we discuss two extensions to the baseline model. First, we explore the relationship between the equilibrium tax and diversity if we add the political process of majority voting. Second, we study the relationship between fragmentation of the minority group at the intensive margin. Both these results are important when we test the predictions from our model on the data.

Majority voting

So far we have made no assumptions on the political process of how a government chooses taxes. Suppose we add a stage to the game with majority voting over taxes before the government sets the taxes. Groups will have their individually preferred tax rate. This implies that the median voter is well defined for a given $\boldsymbol{\phi}_m$. If the median voter is in the majority group, $t^*_{maj}(\boldsymbol{\phi}_m)$ will be imposed. If the median voter is in a minority group, $t^*_{min}(\boldsymbol{\phi}_m)$ will be imposed. We know from Proposition 1 that smaller groups prefer higher taxes and bigger groups prefer lower taxes. This means that when the majority group no longer has the median voter, i.e. if $\phi_1 < 0.5$, a minority group will have the median voter. This gives us the following result:

Proposition 4. *Suppose $m \geq 3$. In a political process of majority voting, the equilibrium regulatory tax will be $t^*_{med}(\phi_1, m) = t^*_{maj}(\phi_1, m)$ for $\phi_1 > 0.5$, and $t^*_{med}(\phi_1, m) = t^*_{min}(\phi_1, m)$ for $\phi_1 < 0.5$*

Proposition 4 says that there is a discontinuity in $t^*_{med}(\phi_1, m)$ at $\phi_1 = 0.5$ when $m \geq 3$. This discontinuity at $\phi_1 = 0.5$ is a result of majority voting. At $\phi_1 = 0.5$ the government switches from prioritizing the majority group to prioritizing a minority which means higher taxes than $t^*_{maj}(0.5, m)$. Given part 1 of Proposition 2 this means that for $\phi_1 > 0.5$ the tax rate is decreasing with ϕ_1.

If $\phi_1 < 0.5$, then the median voter is in a minority group. From part 3 of Proposition 2 for a minority government we know that if $m > \underline{m}$, then $\exists \hat{\phi} \equiv \hat{\phi}(m, \alpha, \beta) \in (1/m, 1)$ such that for all $\phi_1 < \hat{\phi}$

$$\frac{\partial t^*_{med}(\phi_1, m)}{\partial \phi_1} > 0 \tag{12}$$

and if $\hat{\phi} < 0.5$, then for all $\phi_1 > \hat{\phi}$

$$\frac{\partial t^*_{med}(\phi_1, m)}{\partial \phi_1} < 0 \tag{13}$$

If $m \leq \underline{m}$, then

$$\frac{\partial t^*_{med}(\phi_1, m)}{\partial \phi_1} < 0 \tag{14}$$

Summing up, majority voting implies a non-monotonic relationship between taxes and diversity at the intensive margin. If the majority is the median voter ($\phi_1 > 0.5$) or when there are only few groups ($m \leq \underline{m}$), then equilibrium taxes monotonically decline with higher ϕ_1.

Fragmentation of the minority group

In Proposition 3 we explored the relationship between taxes and fragmentation of the minority at the extensive margin as minorities became smaller through the introduction of a new group. We established that higher fragmentation at the extensive margin unambiguously leads to an increase in taxes. In this section, we explore how fragmentation of the minority affects taxation at the intensive margin.

Without loss of generality assume that group 2 is the largest minority group i.e. $\phi_2 \in (\frac{1}{m-1}, \phi_1)$. Again, for simplicity we assume that all other smaller minority groups are of the same size, specifically, $\phi_i = \frac{1-\phi_1-\phi_2}{m-2}$ $\forall i \in M \backslash \{1, 2\}$. Similar to ϕ_1, ϕ_2 is a proxy of the fragmentation within the minority. Higher ϕ_2 implies lower fragmentation of the minority at the intensive margin.

Assume that the political process is majority voting. Then, for $\phi_1 > 0.5$ we have majority government taxes. For $\phi_1 < 0.5$ and $\phi_1 + \phi_2 > 0.5$ the biggest minority group, group 2, is the median voter.[2]

Proposition 5. *Suppose $m \geq 3$. Assume that the political process is majority voting.*

1. *For $\phi_1 > 0.5$*
$$\frac{\partial t^*_{med}(\phi_1, \phi_2, m)}{\partial \phi_2} < 0 \tag{15}$$
2. *For $\phi_1 < 0.5$ and $\phi_1 + \phi_2 > 0.5$*
$$\frac{\partial t^*_{med}(\phi_1, \phi_2, m)}{\partial \phi_2} < 0 \tag{16}$$

The second part of the proposition states that if group 2 is the median voter taxes decline as ϕ_2 increases. Clearly, as group 2 grows larger smaller minority groups become smaller and externalities imposed on it decline. The first part of the proposition reveals that if there is a big enough majority group then increases in ϕ_2 results in lower taxes. This is because as ϕ_2 becomes larger the increase in the negative externality on group 1 by group 2 is less than the decrease in negative externalities coming from all the other smaller groups. In other words, higher fragmentation of the minority group results in higher taxes imposed by the majority government. We use this particular result when testing our predictions using U.S. data.

[2] We omit the case of $\phi_1 + \phi_2 < 0.5$ in which a smaller minority group sets the tax rate. This case is qualitatively similar to the third part of Proposition 2, but requires more involved parameter restrictions which we do not present here.

3 Empirical Evaluation

In this section, we will provide empirical evidence for 'diversity taxes' using U.S. data from Alesina et al. [1999]. The theoretical analysis in the previous section makes predictions about how intensive and extensive margin variations in diversity affect government taxation and spending. In addition, it relates these predictions to the outcome of the political process (majority versus minority governments). Unfortunately, intensive and extensive margin variations have no counterpart in the data. Instead, empirical work has used fractionalization and polarization indices as measures of diversity to study the effect of diversity on conflict and public spending (Alesina et al. [2000], Esteban et al. [2010], Montalvo and Reynal-Querol [2005]). Fractionalization (Taylor and Hudson [1972]) is defined as the probability that members of two different groups meet one another. Specifically,

$$FRAC = 1 - \sum_{i \in M} \phi_i^2 \tag{17}$$

Polarization captures how far the distribution of groups is from a bipolar distribution which represents the highest level of polarization. We use the Reynal-Querol index (Reynal-Querol [2002]) to measure polarization within a given population:

$$POL = 1 - \sum_{i \in M} \left(\frac{0.5 - \phi_i}{0.5} \right)^2 \phi_i \tag{18}$$

Both indices are imperfect measures for our two-dimensional specification of diversity. More specifically, fractionalization and polarization move in opposite directions at the extensive margin and at the intensive margin fractionalization and polarization monotonically decreases with ϕ_1.

Lemma 2. *Assume* $\boldsymbol{\phi}_m = (\phi_1, \frac{1-\phi_1}{m-1}, ..., \frac{1-\phi_1}{m-1})$
At the extensive margin:

- *If* $\phi_1 \in (1/m, 1)\ \forall\ m > 2$, $\frac{\Delta FRAC}{\Delta m} > 0$.
- *If* $\phi_1 \in (1/m, 1)\ \forall\ m > 2$, $\frac{\Delta POL}{\Delta m} < 0$.

At the intensive margin:

- *If* $m > 2\ \forall\ \phi_1 \in (1/m, 1)$, $\frac{\partial FRAC}{\partial \phi_1} < 0$.
- *If* $m > 2\ \forall\ \phi_1 \in (1/m, 1)$, $\frac{\partial POL}{\partial \phi_1} < 0$.

At the intensive margin, $FRAC$ decreases with ϕ_1 because the probability of meeting other groups decreases as small groups become smaller, whereas POL decreases with ϕ_1 as minority groups become smaller they move further away from the distribution $(1/2, 1/2, 0, ..., 0)$. At the extensive margin, more number of groups increase $FRAC$ because of increased probability of randomly meeting a member of different group, whereas more groups enlarge the difference between the sizes of the majority and the largest minority, decreasing POL.

The data set provided by Alesina et al. [1999] contains a fixed number of ethnic groups and hence, it rules out any analysis along the extensive margin of diversity. As a result, we will adjust our theoretical framework to derive predictions specific to the intensive margin variation of diversity. Before doing so, we will briefly describe the data we use to conduct our empirical analysis.

3.1 Data and Sources

Alesina et al. [1999] provide a comprehensive database on ethnic fractionalization and public finances for three levels of U.S. urban localities in the year 1990: cities, counties, and metropolitan areas.[3] They use an ethnic fractionalization index as their measure of ethnic fragmentation:

$$ETHNIC = 1 - \sum_i (Race_i)^2 \tag{19}$$

where $Race_i$ denotes the share of population self-identified as of race i where

$$i = \{\text{White, Black, Asian and Pacific Islander, American Indian, Other}\}$$

This racial classification is adopted from the U.S. Census. It is noteworthy that Hispanics as an ethnic group fall under the category "Other". Table 1 gives a description of all the variables we employ from the data set.[4] To test our hypothesis about the existence of 'diversity taxes', we use the data on population distribution by race to construct a variety of indices measuring the degree of ethnic fragmentation. More specifically, we construct an index of *ethnic polarization* as in (18) which captures how far the distribution of ethnic groups is from a bipolar distribution. The index *size of majority group* measures the dominance of one ethnic group. With *fractionalization of minority* and *size of biggest minority group* we try to capture the fragmentation of the minority groups. Below we will derive distinct theoretical predictions for how we expect these different ethnic diversity variables to impact local taxes per capita.

A second set of variables concerns government finances on the local level. For all three levels of aggregation (city, county, and metropolitan areas), we have data on general local government expenditures per capita as well as total local government taxes per capita. The data set also allows us to break down general expenditure into specific categories (health spending, education spending, police spending, welfare spending, and others), although sometimes only at county or metro level. We also observe the debt per capita local government debt outstanding per capita on the county and metro level. Finally, the Alesina et al. [1999] data set allows us to control for a variety of factors beyond ethnic diversity which might affect local government taxation and spending, such as population size, the percentage of people above 25 with a Bachelor's degree or higher, fraction of the population above 65, violent crimes per capita, median and mean income

[3] The data can be accessed through the World Bank:
https://datacatalog.worldbank.org/dataset/wps2108-public-goods-and-ethnic-divisions

[4] A detailed description of the data set and data sources can be found in Alesina et al. [1999].

per capita, as well as mean-to-median income (as a measure of inequality). Table 2 provides summary statistics for all variables in our data set (at city level).

3.2 Modified Model

Given the data availability described above, we make the following modifications to our general model. Assume that diversity changes only at the intensive margin and keep m fixed. Further assume that the majority group is the median voter i.e. $\phi_1 > 0.5$ and $\lambda_1 = 1$. This implies that the majority group is effectively setting its most preferred tax rate. The majority group will set a tax rate which is positively related to the total amount of externalities that the minority groups as a whole impose on the majority group.

Corollary 3. *Assume m is fixed and $\phi_1 > 0.5$. Then the tax parameter t^* is chosen by the majority and positively correlated with the total amount of externalities imposed on the majority group.*

Thus, our model predicts that for localities in which there is a majority, local government taxes per capita are positively correlated with the amount of externalities imposed on the majority group. In the following, we present a set of testable predictions based on how ethnic composition impacts the negative externalities imposed on the majority group.

In the modified version of our model, all variation in diversity occurs along the intensive margin, i.e. through changes in the distribution of people over a fixed number of ethnic groups (i.e. through the vector $\boldsymbol{\phi}_m$). Proposition 2 showed that an increase in the size of the majority leads to a decrease in the total amount of externalities imposed on the majority group. As a result, our first prediction is that the majority government imposes a lower tax rate as the size of the majority increases.

Prediction 1. *Total local government taxes per capita are negatively correlated with the size of the majority, i.e.*

$$\frac{\partial t^*_{maj}(\phi_1, \phi_2, m)}{\partial \phi_1} < 0 \tag{20}$$

Furthermore, Lemma 2 showed that both the fractionalization index as well as the polarization index decrease when the majority group grows bigger. This implies that the total amount of negative externalities imposed on the majority group is increasing in fractionalization and polarization. This gives rise to our second prediction.

Prediction 2. *Both the fractionalization index and the polarization index are positively correlated with local government taxes per capita.*

Next, consider variations in the composition of the minority groups. More specifically, assume that the biggest minority group gets bigger (i.e. ϕ_2 increases) while holding the size of the majority constant. From Proposition 5 we know that this reduces the total amount of externalities imposed on the majority group. As a result, the tax rate set by the majority government will decrease.

Prediction 3. *Total local government taxes per capita are negatively correlated with the size of the biggest minority group, i.e.*

$$\frac{\partial t^*_{maj}(\phi_1, \phi_2, m)}{\partial \phi_2} < 0 \tag{21}$$

In our model, ϕ_2 measures the size of the biggest minority group and as such is also a proxy for the relative sizes of the minority groups. This comes from the simplifying assumption that other minority groups are the same size. When looking at the data, the level of fractionalization within the minority is a related indicator of how cultural externalities of the minority are affecting the majority. Fractionalization of the minority is given by:

$$FRACMIN = 1 - \sum_{i \neq 1} \left(\frac{\phi_i}{1 - \phi_1} \right)^2 \tag{22}$$

As group 2 is the biggest minority, this implies that $\frac{\partial FRACMIN}{\partial \phi_2} < 0$. That is, as group 2 gets smaller, minority groups become more similar in size and the fractionalization of the minority groups increases. This increases the total amount of externalities imposed on the majority group. From this observation we obtain our final prediction from the theoretical analysis.

Prediction 4. *Total local government taxes per capita are positively correlated with the fractionalization of minority groups.*

In the next subsection, we test our four theoretical predictions on the data set from Alesina et al. [1999]. We have excluded metropolitan area level data for two reasons. First, very few of the regressions we ran resulted in any significant relationships between dependent variables and independent variables.[5] Second, our theory rests on negative consumption externalities between ethnically diverse groups. We expect such externalities to be most relevant on the smallest levels of observation, i.e. city and county level. Metropolitan area level data is rather aggregated and might mask the channel from diversity to taxation we wish to explore. Hence, we restrict attention to city and county level data. Furthermore, as our theoretical predictions are derived under the assumption that there is a majority government, we drop all cities and counties from the sample in which there is no majority, i.e. in which no ethnic group has more than 50% share of the population.[6]

3.3 Results

We find evidence in the data for all four of our theoretical predictions. We structure the discussion of our empirical results around these four predictions.

[5] Metropolitan area level data contains the fewest observations (311) compared to city level (1076) and county level (1400) data, thus reducing the chances of finding statistically significant relationships between variables within the data.

[6] This implies dropping 31 cities, reducing the sample of cities from 1076 to 1045, and dropping 6 counties, reducing the sample of counties from 1400 to 1394. Hence, this sub-sampling of the data comes with little reduction of sample size.

3.3.1 Documenting diversity taxes: taxes per capita and ethnic fractionalization

We first test Prediction 2 from above. We expect the fractionalization index of ethnic diversity to be positively correlated with taxes per capita. Table 3 presents results from a regression analysis on city level data. We regress different fiscal variables on an ethnic fractionalization index as constructed in (19). The first two columns of the table present our results from the city-level analysis. In the first column of the table we regress taxes per capita on ethnic fractionalization and various city-level controls. We find that ethnic fractionalization is positively influencing taxes per capita. This finding is statistically significant after controlling for income per capita, population size, fraction of people above 25 with a Bachelor's degree or higher, inequality, fraction of the population above 65, violence per capita, and state-fixed effects. We conclude that the data confirms our prediction about the impact of fractionalization on local taxation.[7] To quantify the relevance of the impact of diversity on local government taxation, consider the average U.S. city in 1990. No diversity (fully homogeneous population) results in \$248.77 of taxes per capita for such an otherwise average city, while maximum diversity would imply taxes per capita of \$415.64. Fully homogenizing U.S. cities in 1990 would reduce taxes per capita by an average of 15.96%. This suggest that 'diversity taxes' are significant and relevant drivers of both the level and the variation of city taxes per capita observed in the data.

The second column of Table 3 presents the results from regressing total city government expenditures per capita on ethnic fractionalization and the various controls. We find a positive and significant effect of fractionalization on expenditures. This is in line with our prediction that more diversity leads to more provision of (secular) public goods as a by-product of the government regulating negative externalities arising from diversity through taxation. The effect of ethnic diversity on local exenditures per capita is of considerable size (although less significant than the impact of diversity on taxation). The government of a fully homogenized city ($ETHNIC = 0$) in the U.S. in 1990 spends \$215.14 less than its fully heterogenized counterpart ($ETHNIC = 1$). Fully homogenizing U.S. cities in 1990 would reduce government expenditures per capita by an average of 6.98%.

The third and fourth column of Table 3 repeat the analysis for county-level data. We find that ethnic fractionalization has a positive and significant impact on taxes per capita.[8] The magnitude of this impact is less than on the city level. Fully homogenizing U.S. counties in 1990 would reduce taxes per capita by an average of 4.9%. Similarly, ethnic fractionalization positively and significantly impacts expenditure per capita on county level. Fully homogenizing U.S. counties in 1990 would reduce expenditure per capita by an average of 6.46%. We conclude that 'diversity taxes' are impactful on the county level, although less so than on city level. This

[7] We ran the same type of regression with ethnic polarization as in (18) and found a positive and significant effect as well.

[8] We ran regressions with our polarization index and obtained qualitatively similar and significant result.

is in line with our hypothesis that negative externalities from cultural diversity mostly arise in interactions between people in small localities, i.e. neighborhoods or cities. County level data also includes a spending category 'Public Welfare'. Our proposed channel from diversity to taxation implies that the government does not redistribute its tax revenues back to the different groups through public transfers, but rather spends the revenues on secular goods (roads, sewage, police, schools, hospitals etc.). Table 5 reports the results from regressing several public expenditure categories on ethnic fractionalization. We find no significant relationship between the fractionalization and the share of welfare spending on county level. This strengthens our notion of a government which taxes the consumption of cultural goods and provides secular goods instead. Table 5 shows that neither the spending share for education nor for hospitals is significantly correlated with ethnic diversity. Only the county level share of expenditures on roads is significant and negatively correlated with ethnic fractionalization.[9] We conclude that there is a significant and positive impact of ethnic fractionalization on both taxes per capita and expenditures per capita. However, there is a less significant relationship between ethnic fractionalization and specific expenditure categories. Importantly for us, ethnic fractionalization does not significantly increase welfare spending.

Regressing taxes per capita on ethnic fractionalization might be problematic if taxes per capita have a causal impact on ethnic diversity. To address this endogeneity concern, we follow Alesina et al. [1999] and instrument ethnic fractionalization in 1990 by ethnic fractionalization in 1980. This instrument is relevant as ethnic fractionalization in 1980 is sufficiently correlated with ethnic fractionalization in 1990. The instrument is exogenous as tax rates in 1990 cannot causally explain ethnic fractionalization in 1980. The results from the two-stage-least squares are reported in Table 6. We find that the impact of ethnic fractionalization on taxes per capita and expenditures per capita remains positive and significant.

To sum up, data on U.S. cities and counties in 1990 confirm our prediction that more ethnic diversity (as measured by fractionalization or polarization) leads to more government taxation and public expenditure. However, mutliple explanations are possible for this positive relationship between diversity and taxation. In the following, we try to identify the empirical importance of our proposed channel by testing predictions from our model which are specific to our notion of 'diversity taxes'.

3.3.2 Exploring the channel: taxes per capita, majority size and minority fragmentation

Our theoretical analysis predicts (i) a negative relation between taxes per capita and the size of the majority (Prediction 1), (ii) a negative relation between taxes per capita and the size of the

[9]This observation is in line with the findings of Alesina et al. (1999). They hypothesize that more ethnic fractionalization leads to less 'productive' public provision (roads, education, sewerage) due to heterogeneity of preferences across ethnic groups.

biggest minority group (Prediction 3), and (iii) a positive relation between taxes per capita and the fragmentation of majority groups (Prediction 4).

Table 4 reports the results from regressing taxes per capita on the different variables of ethnic diversity on city and county level. We run two specifications per local level. Both specifications test for the impact of the size of the majority as well the fragmentation of the minority on local taxes per capita. In the first specification, we capture minority fragmentation by the fractionalization of the minority. In the second specification, we use the size of the biggest minority group as a measure of minority fragmentation. Consider columns (1) and (3) which show the results from regressing taxes per capita on the size of the majority and the fractionalization of the minority. We find that the size of majority is negatively impacting taxes per capita while fractionalization of the minority is positively influencing taxes per capita, both on the city and on the county level. Next, consider columns (2) and (4). We regress taxes per capita on the size of the majority group and the size of the biggest minority group. Again, we obtain a significant negative impact from the size of the majority on taxes per capita. In addition, we find that the size of the biggest minority group is significantly and negatively affecting taxes per capita. We conclude that prediction 1, prediction 3, and prediction 4 are confirmed. We believe that the evidence presented in Table 4 makes a strong case for the explanation of 'diversity taxes' through the taxation of negative externalities. Our theoretical analysis establishes a positive link between taxes per capita and total negative externalities imposed on the majority group. As we discussed, this link is able to explain the direction and significance of the coefficients reported in Table 4 which might otherwise be puzzling.

We conclude that the empirical evidence for U.S. cities and counties in 1990 confirms the predictions from our theoretical analysis. More ethnic diversity (as measured by fractionalization or polarization indices) leads to more taxes per capita and local government expenditure per capita. We see this as evidence for 'diversity taxes'. Our model explains the existence of these diversity taxes in the context of diverse groups imposing negative consumption externalities on each other. We tested this theory by relating the total amount of negative externalities imposed on the majority group by minority groups to various characteristics of the distribution of groups. The empirical evidence confirms a significant positive relationship between taxes per capita observed in the data and the amount of negative externalities imposed on the majority as we infer it from the distribution of groups. We see this as evidence for our hypothesized channel which relates diversity to taxation.

4 Conclusion

We propose a model in which governments use taxes to control negative consumption externalities created between diverse groups, thereby mitigating social conflict. We study the relationship between different types of governments (utilitarian, majority, minority) and the taxes they impose for a given level of diversity. We measure diversity along two different dimensions. One way to increase diversity is to increase the number of groups (extensive margin), the other way is to decrease the size of the majority group (intensive margin). We find that when diversity increases at the extensive margin, all types of governments increase regulation. When diversity increases at the intensive margin, it depends on what type of government is regulating cultural good consumption. A majority or a utilitarian government increases regulation as diversity increases. A minority government increases regulation as diversity increases until the majority and minority have more comparable sizes at which point lowering taxation would benefit own cultural good production.

One of the main predictions from our theoretical analysis is that more diversity leads to a bigger size of the government as measured by taxes per capita. We test this prediction using the U.S. city and county data provided by Alesina et al. [1999]. We find robust and significant evidence for the existence of 'diversity taxes' even after including a variety of socioeconomic and demographic controls and after instrumenting for ethnic fractionalization. We further document significant relationships between majority group size and taxes as well as between minority fractionalization and taxes in line with the predictions of our theory. These results lend credence to our notion of social conflict manifesting itself in negative consumption externalities between diverse groups, and its regulation through public policy.

Table 1: Variable Description
(Observations are for 1990 unless otherwise noted)

Ethnicity	
Ethnic Fractionalization	Measures the probability that two persons drawn randomly from the population belong to different self-identified ethnic groups; ranges from 0 to 1; ranges from 0 (complete homogeneity) to 1 (complete heterogeneity)
Ethnic Polarization	Captures how far the distribution of the ethnic groups is from the $(1/2, 0, 0, ...0, 1/2)$ distribution (bipolar), which represents the highest level of polarization.
Fractionalization of Minority	Measures the ethnic fractionalization of the population excluding the majority group
Size of Majority Group	Majority group size as a fraction of the population
Size of Biggest Minority Group	Size of second biggest group as a fraction of the population
Black	Fraction of population self-identifying as Black
White	Fraction of population self-identifying as White
Asian	Fraction of population self-identifying as Asian or Pacific Islander
American Indian	Fraction of population self-identifying as American Indian, Eskimo, or Aleut
Other Race	Fraction of population self-identifying as not Black, American Indian, Asian, or White; proxy for Hispanic
Government	
Expenditures per Capita	General local government expenditure per capita, 1990-1991
Health Spending	Fraction of general local government expenditure for health and hospitals (county and metro only)
Education Spending	Fraction of general local government expenditure for education (county and metro only)
Police Spending	Fraction of general local government expenditure for police
Welfare Spending	Fraction of general local government expenditure for public welfare (county and metro only)
Taxes per Capita	Total local government taxes per capita, 1990-1991
Debt per Capita	Per capita local government debt outstanding (county and metro only)
Income, Education, and Population	
Population Size	Log of population size
Percentage BA Graduate	Persons 25 years and over, fraction with Bachelor's degree or higher
Population above 65	Fraction of population that is 65 years or older
Violence per Capita	Violent crimes per capita (murder, forcible rape, robbery, aggravated assault)
Income per Capita	Per capita money income, 1989
Median household income	Median household income, 1989
Mean-to-Median Income	Ratio of mean to median household income

Table 2: Summary Statistics for City Data (subset of cities with majority)

Variable Name	Mean	St. Dev.	Min	Max	N	Unit
Fractionalization Index	0.283	0.169	0.014	0.737	1,045	Fraction
Polarization Index	0.489	0.271	0.029	0.991	1,045	Fraction
Fractionalization of Minority	0.451	0.205	0.010	0.743	1,045	Fraction
Size of Majority Group	0.818	0.132	0.503	0.993	1,045	Fraction
Size of Biggest Minority Group	0.133	0.117	0.003	0.475	1,045	Fraction
Black	0.112	0.153	0.0004	0.981	1,045	Fraction
White	0.801	0.170	0.016	0.993	1,045	Fraction
Asian	0.037	0.072	0.0003	0.838	1,045	Fraction
American Indian, Eskimo, Aleut	0.006	0.011	0.0003	0.138	1,045	Fraction
Other	0.044	0.074	0.0004	0.669	1,04	Fraction
Expenditures per Capita	872.883	555.759	161.000	7,154.000	991	$ per capita
Taxes per Capita	371.661	276.314	38.487	3,977.627	991	$ per capita
Population Size	10.961	0.759	10.127	15.806	1,045	Log of # people
Percentage BA Graduate	0.230	0.118	0.016	0.712	1,045	Fraction
Population above 65	0.126	0.052	0.020	0.485	1,045	Fraction
Violence per Capita	7.780	6.740	0.023	47.348	923	# crimes per capita
Income Per Capita	14,936.730	5,031.352	5,561	55,463	1,045	$ per capita
Mean-to-Median Income	1.263	0.139	1.030	2.247	1,045	Ratio

Table 3: Fractionalization, Taxation and Public Spending

	City Level		County Level	
	Tax per Capita	Exp per Capita	Tax per Capita	Exp per Capita
	(1)	(2)	(3)	(4)
Ethnic Fractionalization	166.863***	215.143*	165.145***	616.171***
	(60.108)	(125.338)	(54.653)	(137.133)
Income per Capita	0.020***	0.020***	0.066***	0.041***
	(0.003)	(0.007)	(0.004)	(0.008)
Log Population Size	47.518***	113.099***	−7.101	1.435
	(15.972)	(29.431)	(8.702)	(18.906)
Education	−59.211	64.019	−170.490	−429.975
	(115.207)	(259.619)	(124.581)	(284.288)
Inequality	225.917***	428.224**	131.340*	634.596***
	(80.312)	(183.017)	(75.052)	(201.390)
Violence per Capita	5.270**	14.645***	13.854***	30.861***
	(2.240)	(3.353)	(2.223)	(5.789)
Population Above 65	251.207*	516.633	852.521***	1,061.297**
	(144.967)	(367.303)	(188.155)	(425.416)
Debt per Capita			0.005	0.019*
			(0.003)	(0.011)
State Fixed Effects	Yes	Yes	Yes	Yes
Observations	912	912	1,345	1,345
R^2	0.692	0.629	0.789	0.630
Adjusted R^2	0.673	0.605	0.780	0.614

Note: Robust standard errors in parentheses. *p<0.1; **p<0.05; ***p<0.01

Table 4: Majority Size and Minority Fragmentation

	Dependent Variable: Taxes per Capita			
	City Level		County Level	
	(1)	(2)	(3)	(4)
Size of Majority	−349.450***	−622.170***	−346.184***	−723.692**
	(94.766)	(237.568)	(71.038)	(294.014)
Fractionalization of Minority	182.803***		116.379***	
	(61.521)		(31.264)	
Size of Biggest Minority Group		−491.237*		−522.388*
		(252.308)		(295.083)
Income per Capita	0.020***	0.020***	0.065***	0.065***
	(0.003)	(0.003)	(0.004)	(0.004)
Log Population Size	44.026***	45.795***	−5.835	−8.657
	(16.173)	(16.118)	(8.769)	(8.915)
Education	−76.389	−74.880	−183.286	−160.033
	(113.974)	(117.475)	(124.828)	(124.355)
Inequality	243.188***	234.791***	96.491	90.828
	(79.583)	(81.757)	(72.909)	(73.574)
Violence per Capita	4.934**	4.711**	13.125***	12.908***
	(2.289)	(2.288)	(2.146)	(2.161)
Population Above 65	334.072**	288.670*	952.514***	929.586***
	(154.699)	(151.368)	(186.796)	(190.918)
Debt per Capita			0.004	0.004
			(0.003)	(0.003)
State Fixed Effects	Yes	Yes	Yes	Yes
Observations	885	885	1,341	1,341
R^2	0.698	0.695	0.791	0.790
Adjusted R^2	0.677	0.674	0.782	0.781

Note: Robust standard errors in parentheses. *p<0.1; **p<0.05; ***p<0.01

Table 5: Ethnic Fractionalization and Expenditure Categories (County Level)

	Share of general expenditures for			
	Welfare	Roads	Education	Hospitals
	(1)	(2)	(3)	(4)
Ethnic Fractionalization	0.011	-0.024^{***}	-0.031	-0.003
	(0.007)	(0.007)	(0.031)	(0.037)
Income per Capita	-0.00000^{***}	-0.00000	0.00000	-0.00000
	(0.00000)	(0.00000)	(0.00000)	(0.00000)
Log Population Size	0.002^{**}	-0.008^{***}	-0.014^{***}	-0.006
	(0.001)	(0.001)	(0.004)	(0.004)
Education	0.035^{*}	0.027^{*}	-0.442^{***}	0.063
	(0.018)	(0.014)	(0.063)	(0.072)
Inequality	0.004	-0.034^{***}	-0.049	0.133^{***}
	(0.012)	(0.008)	(0.043)	(0.041)
Violence per Capita	-0.0001	-0.0001	-0.005^{***}	0.001
	(0.0002)	(0.0003)	(0.001)	(0.001)
Population Above 65	0.080^{***}	0.083^{***}	-0.836^{***}	0.067
	(0.020)	(0.023)	(0.096)	(0.097)
Debt per Capita	0.00000	-0.00000	-0.00000	-0.00000
	(0.00000)	(0.00000)	(0.00000)	(0.00000)
State Fixed Effects	Yes	Yes	Yes	Yes
Observations	1,341	1,341	1,341	1,341
R^2	0.750	0.592	0.441	0.236
Adjusted R^2	0.739	0.575	0.417	0.203

Note: Robust standard errors in parentheses. $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

Table 6: Instrumented Ethnic Fractionalization (County Level)

	Dependent variable:	
	Taxes per Capita	Exp per Capita
	(1)	(2)
Ethnic Fractionalization (instrumented)	142.697**	591.160***
	(55.485)	(136.126)
Income per Capita	0.065***	0.041***
	(0.003)	(0.008)
Log Population Size	−5.596	0.812
	(7.065)	(17.332)
Education	−162.238	−433.594
	(114.169)	(280.099)
Inequality	122.420*	649.493***
	(68.792)	(168.773)
Violence per Capita	844.295***	1,035.676***
	(160.114)	(392.820)
Population Above 65	0.004***	0.019***
	(0.001)	(0.004)
Debt per Capita	13.606***	31.671***
	(1.784)	(4.376)
State Fixed Effects	Yes	Yes
Observations	1,341	1,341
R^2	0.789	0.629
Adjusted R^2	0.780	0.613

Note: Robust standard errors in parentheses. *p<0.1; **p<0.05; ***p<0.01

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Appendices

Proof of Lemma 1

The first order condition of a government with social weights $\lambda = (\lambda_1, ..., \lambda_m)$ and diversity vector $\phi = (\phi_1, ..., \phi_m)$ is given by:

$$\sum_{i \in M} \lambda_i \phi_i \Big(u^i_{E_i} \frac{\partial E_i}{\partial t} + u^i_{c_i} \frac{\partial c_i}{\partial t} + u^i_g \frac{\partial g}{\partial t} + u^i_{E_{-i}} \frac{\partial E_{-i}}{\partial t} \Big) = 0 \tag{23}$$

$$\iff \sum_{i \in M} \lambda_i \phi_i \Big(-\frac{\alpha}{1-t} - \frac{\beta}{1-t} + \frac{\gamma}{t} + \sum_{j \neq i} \frac{\alpha w \phi_j}{\alpha + \beta \phi_j} \Big) = 0 \tag{24}$$

$$\iff \frac{(\alpha+\beta+\gamma)t - \gamma}{t(1-t)} = \frac{\alpha w \sum_{i \in M} \lambda_i \phi_i \left(\sum_{j \neq i} \frac{\phi_j}{\alpha + \beta \phi_j} \right)}{\sum_{i \in M} \lambda_i \phi_i} \equiv \Omega \tag{25}$$

$$\implies t = \frac{1}{2} - \frac{1}{2\Omega} \pm \sqrt{\left(\frac{1}{2\Omega} - \frac{1}{2}\right)^2 + \frac{\gamma}{\Omega}} \tag{26}$$

where only the positive root implies positive values for t.

Proof of Corollary 1

We have that

$$\frac{\partial t^*}{\partial \Omega} = \frac{\Omega - 1 - 2\gamma\Omega + \sqrt{1 + \Omega(-2 + 4\gamma + \Omega)}}{2\Omega^2 \sqrt{1 + \Omega(-2 + 4\gamma + \Omega)}} \tag{27}$$

which is greater than zero if

$$(1 - \Omega + 2\gamma\Omega)^2 < 1 - 2\Omega + 4\Omega\gamma + \Omega^2 \tag{28}$$

$$\iff 1 - \Omega < 1 - \gamma\Omega \tag{29}$$

which is the case for $0 < \gamma < 1$.

Proof of Proposition 1

It holds that

$$\Omega_{min}(\phi) \geq \Omega_{maj}(\phi) \tag{30}$$

$$\iff \quad \frac{\phi_1}{\alpha+\beta\phi_1} + \sum_{j\neq i} \frac{\phi_j}{\alpha+\beta\phi_j} \geq \frac{\phi_i}{\alpha+\beta\phi_i} + \sum_{j\neq i} \frac{\phi_j}{\alpha+\beta\phi_j} \tag{31}$$

$$\implies \phi_1 \geq \phi_i \tag{32}$$

as $\phi_1 > 1/m = \phi_i$. Since $\Omega_u(\phi)$ is a convex combination of $\Omega_{min}(\phi)$ and $\Omega_{maj}(\phi)$ we have $\Omega_{min}(\phi) \geq \Omega_u(\phi) \geq \Omega_{maj}(\phi)$. This proves the result.

Proof of Proposition 2

For the **utilitarian government** we get

$$\Omega_u(\phi) = \alpha w \sum_{i\in M} \phi_i \sum_{j\neq i} \frac{\phi_j}{\alpha+\beta\phi_j} \tag{33}$$

$$= \alpha w \left[\frac{\phi_1(m-1)\frac{(1-\phi_1)}{m-1}}{\frac{1-\phi_1}{m-1}\beta+\alpha} + \sum_{j\neq 1} \frac{1-\phi_1}{m-1} \left(\frac{\phi_1}{\alpha+\beta\phi_1} + \frac{(m-2)(1-\phi_1)}{(m-1)\left(\frac{1-\phi_1}{m-1}\beta+\alpha\right)} \right) \right] \tag{34}$$

$$= \alpha w \left[\frac{\phi_1(1-\phi_1)(m-1)}{(1-\phi_1)\beta+\alpha(m-1)} + \frac{(1-\phi_1)\phi_1}{\alpha+\beta\phi_1} + \frac{(m-2)(1-\phi_1)^2}{(1-\phi_1)\beta+(m-1)\alpha} \right] \tag{35}$$

from which we obtain

$$\frac{\partial\Omega_u(\phi)}{\partial\phi_1} = \frac{\alpha^2(\alpha+\beta)\left[\beta+2(m-1)\alpha+(m-2)\phi_1\beta\right](1-\phi_1 m)w}{\left[\beta+\alpha(m-1)-\phi_1\beta\right]^2(\alpha+\beta\phi_1)^2} < 0 \tag{36}$$

as $\phi_1 > \frac{1}{m}$.

For the **majority government** we get

$$\Omega_{maj}(\phi) = \alpha w \sum_{j\neq 1} \frac{\phi_j}{\alpha+\beta\phi_j} \tag{37}$$

$$= \alpha w \sum_{j\neq 1} \frac{\frac{1-\phi_1}{m-1}}{\alpha+\beta\frac{1-\phi_1}{m-1}} \tag{38}$$

$$= \alpha w \left[\frac{1-\phi_1}{\frac{1-\phi_1}{m-1}\beta+\alpha} \right] \tag{39}$$

from which we obtain

$$\frac{\partial\Omega_{maj}(\phi)}{\partial\phi_1} = -\frac{\alpha^2(m-1)^2 w}{\left[\beta+(m-1)\alpha-\beta\phi_1\right]^2} < 0 \tag{40}$$

For the **minority government** we get

$$\Omega_{min}(\phi) = \alpha w \left[\frac{\phi_1}{\alpha + \beta\phi_1} + \frac{(m-2)\frac{1-\phi_1}{m-1}}{\frac{1-\phi_1}{m-1}\beta + \alpha} \right] \tag{41}$$

from which we obtain

$$\frac{\partial\Omega_{min}(\phi)}{\partial\phi_1} = \frac{\alpha^2 w \left[\alpha^2(m-1) - 2\alpha\beta(m-1)(\phi_1(m-1)-1) - \beta^2(-1+\phi_1(2+\phi_1+(m-3)m\phi_1))\right]}{\left[\beta+\alpha(m-1)-\beta\phi_1\right]^2\left[\alpha+\beta\phi_1\right]^2} \tag{42}$$

the (positive valued) root of which is

$$\hat{\phi}_1(m,\alpha,\beta) = -\frac{\beta^2 + \alpha\beta(m-1)^2 - \sqrt{\beta^2(m-2)(m-1)(\beta+\alpha m)^2}}{\beta^2(1+(m-3)m)} \tag{43}$$

$$= \frac{(\beta+\alpha m)\sqrt{(m-2)(m-1)} - \alpha(m-1)^2 - \beta}{\beta\,(1+(m-3)m)} \tag{44}$$

$\Omega_{min}(\phi)$ is increasing in ϕ_1 to the left of $\hat{\phi}_1(m,\alpha,\beta)$ and decreasing to the right of it. $\hat{\phi}_1(m,\alpha,\beta)$ is greater than zero if

$$m > 1 - \frac{\beta^2}{\alpha^2 + 2\alpha\beta} \tag{45}$$

which always holds for $\alpha, \beta > 0$ and $m \geq 3$. We have that $\hat{\phi}_1(m,\alpha,\beta) < 1$ if

$$m > 2 + \frac{\alpha^2}{2\alpha\beta + \beta^2} \equiv \underline{m}(\alpha,\beta) \tag{46}$$

where $\frac{\partial \underline{m}}{\partial\alpha} > 0$ and $\frac{\partial \underline{m}}{\partial\beta} < 0$. Further, it holds that $\hat{\phi}_1(m,\alpha,\beta) > \frac{1}{m}$ if

$$\beta + \alpha m > 0 \tag{47}$$

which is always true for $\alpha, \beta, m > 0$.

Proof of Proposition 3

Clearly, if $\frac{\partial\Omega_\lambda(\phi)}{\partial m} > 0$ then $\frac{\Delta\Omega}{\Delta m} > 0$. We have

$$\Omega_\lambda(\phi) = \alpha w \left[\lambda_1\phi_1 \frac{1-\phi_1}{\alpha + \beta\frac{1-\phi_1}{m-1}} + (1-\lambda_1)(m-1)\frac{1-\phi_1}{m-1}\frac{(m-2)\frac{1-\phi_1}{m-1}}{\alpha+\beta\frac{1-\phi_1}{m-1}} \right] \tag{48}$$

for which we get

$$\frac{\partial\Omega_\lambda(\phi)}{\partial m} = \alpha w \left[\frac{(\phi_1-1)^2\left[-(\alpha+\beta)(\lambda_1-1)+\beta(2\lambda_1-1)\phi_1\right]}{(\beta+\alpha(m-1)-\beta\phi_1)^2} \right] \tag{49}$$

which is positive for $\phi_1, \lambda_1 \in (0,1)$ and $\alpha, \beta > 0$.

Proof of Proposition 4

Follows from Proposition 2.

Proof of Proposition 5

For $\phi_1 > 0.5$, we have that

$$\Omega_1 = \alpha w \left[\frac{\phi_2}{\alpha + \beta\phi_2} + (m-2)\frac{\frac{1-\phi_1-\phi_2}{m-2}}{\alpha + \beta\frac{1-\phi_1-\phi_2}{m-2}} \right] \tag{50}$$

for which we get

$$\frac{\partial \Omega_1}{\partial \phi_2} = \alpha \left[\frac{1}{(\alpha + \beta\phi_2)^2} - \frac{(m-2)^2}{(\alpha(m-2) + \beta(1-\phi_1-\phi_2))^2} \right] \tag{51}$$

which is smaller than zero as $\phi_2 > \frac{1-\phi_1-\phi_2}{m-2}$.
For $\phi_1 < 0.5$ and $\phi_1 + \phi_2 > 0.5$, we have that

$$\Omega_2 = \alpha w \left[\frac{\phi_1}{\alpha + \beta\phi_1} + (m-2)\frac{\frac{1-\phi_1-\phi_2}{m-2}}{\alpha + \beta\frac{1-\phi_1-\phi_2}{m-2}} \right] \tag{52}$$

for which we get

$$\frac{\partial \Omega_2}{\partial \phi_2} = -\frac{w\alpha^2(m-2)^2}{(\alpha(m-2) + \beta(1-\phi_1-\phi_2))^2} \tag{53}$$

which is smaller than zero.

Proof of Lemma 2

Extensive and intensive margin relationship with fractionalization:

$$FRAC = 1 - \phi_1^2 - (m-1)\Big(\frac{1-\phi_1}{m-1}\Big)^2 \tag{54}$$

$$= 1 - \phi_1^2 - \frac{(1-\phi_1)^2}{m-1} \tag{55}$$

Extensive margin: Clearly $\frac{\Delta FRAC}{\Delta m} > 0$.
Intensive margin: Differentiating $FRAC$ w.r.t ϕ_1 we get, $\frac{\partial FRAC}{\partial \phi_1} < 0 \; \forall \; \phi_1 > 1/m$.
Extensive and intensive margin relationship with polarization:

$$POL = 1 - \sum_{i \in M} \Big(\frac{0.5-\phi_i}{0.5}\Big)^2 \phi_i \tag{56}$$

$$= 4\{\sum_{i \in M} \phi_i^2(1-\phi_i)\} \tag{57}$$

$$= 4\{\phi_1^2(1-\phi_1) + (m-1)\Big(\frac{1-\phi_1}{m-1}\Big)^2(1 - \frac{1-\phi_1}{m-1})\} \tag{58}$$

$$= 4\Big\{\phi_1^2(1-\phi_1) + \frac{(1-\phi_1)^2}{m-1} - \frac{(1-\phi_1)^3}{(m-1)^2}\Big\} \tag{59}$$

Extensive margin: For $m > 2$ we have $\frac{\Delta POL}{\Delta m} < 0$.
Intensive margin: Differentiating with respect to ϕ_1 we get:

$$\frac{\partial POL}{\partial \phi_1} = DPOL \qquad = 4\Big\{(2\phi - 3\phi^2) - 2\frac{1-\phi_1}{m-1} + 3\frac{(1-\phi_1)^2}{(m-1)^2}\Big\} \tag{60}$$

$$= -3\phi_1^2\frac{m(m-2)}{(m-1)^2} + 2\phi_1\frac{m(m-1)-3}{(m-1)^2} - \frac{2m-5}{(m-1)^2} \tag{61}$$

The quadratic roots of $DPOL = 0$ exist and are negative. Since $DPOL$ is a quadratic concave function in ϕ_1 for all $\phi_1 > 0$, $DPOL < 0$. This gives us our result.