Why Do Rich People Make Political Contributions?

Some Surprising Results from a Formal Model

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Abstract: Researchers have repeatedly observed a strong positive correlation between political contributions and income. An obvious inference from this correlation is that growing income inequality should reduce political contributions from those in the lower classes because their income will fall with increased inequality. Similarly, growing income inequality should increase contributions from those in the upper classes because their income will increase with increased inequality. But changes in income and economic inequality are not the same thing. Income is an individual characteristic stemming from personal capabilities, opportunities, decisions, and luck. Income inequality is a property of society, a social fact about the distribution of incomes. The formal model described in this paper demonstrates that income and income inequality operate in different ways. The model considers \( N \) income classes whose gross income is generated by some process outside the model. In the model, government taxes away a portion of this income through an exogenously determined proportional tax on all income above an income “disregard.” Income classes then compete for a share of the resulting tax revenue by making political contributions. The model predicts that when higher income classes are numerically smaller than lower classes so that the income distribution is skewed to the right as we typically find empirically, then political contributions increase with income, but when income is skewed to the left, political contributions decrease with income. Thus, political contributions typically increase with income because there are so few rich people compared to poor ones. When income distributions are right-skewed enough, per-capita contributions increase progressively with income. The model also demonstrates that two kinds of changes in income distributions are possible. One kind of change occurs when income levels remain the same but people move from one level to another. When inequality increases in this way, the lower classes provide more political contributions and upper classes provide fewer. Another kind of change occurs when the incomes attached to classes change. When income increases proportionately for all classes then political contributions increase, but only because mean income has increased. In this situation, relative inequality remains the same. When the ratio of the lowest income to the income step between classes increases, then political contributions increase because mean income increases as well. Relative inequality also decreases because the standard deviation of incomes compared to their overall mean decreases. Thus the paper develops a model that is consistent with the stylized facts about political contributions and income, that provides a reason why the rich contribute more, that makes new predictions about the impact of income inequality, and that provides substantial guidance on how empirical work should proceed.

Introduction

When income becomes more unequally distributed, do the rich contribute more or less to politics? What do lower class political contributors do in these circumstances? Do they give more money to politics or less?

Researchers have repeatedly observed a strong positive correlation between political contributions and income. Not surprisingly, those with more money give more money, and those with less money, give less. An obvious inference from this correlation is that growing income inequality should reduce political contributions from those in the lower classes because their income will fall with increased inequality. Similarly, growing income inequality should increase contributions from those in the upper classes because their income will increase with increased inequality. But should the impact of income inequality be the same as the impact of income?

Changes in income and economic inequality are not the same thing. Income is an individual characteristic stemming from personal capabilities, opportunities, decisions, and luck. Income affects individual behaviors such as political participation because it provides a resource for participation. Nowhere is this more obvious than in political giving. It seems reasonable that those with more income provide greater contributions to politics and that those with less income provide smaller contributions (Verba, Schlozman, Brady, 1995), although we shall present a somewhat surprising argument about why this is so and, in the process, cast some doubt on whether it must always be true. It also seems reasonable to suppose that when a single family moves from a higher income level to a lower one, it will reduce its contributions to politics. But does this necessarily mean that political contributions from the lower classes will decrease and those from the upper classes will increase when inequality widens?

Income inequality is a property of society, a social fact about the distribution of incomes. An increase in inequality will reduce the incomes of lower class families, but it will also change that group’s political circumstances. With this distressing change in social facts, the group might decide to increase its political contributions to redress the situation. It might decide that government should be used to adjust the degree of inequality by changing people’s capabilities, opportunities, luck, or decision-making. It seems possible that lower-class contributions might increase in these circumstances. It also seems possible that upper-class contributions would increase in response. And both lower and upper classes must contend with the fact that increasing political contributions can lead to the political equivalent of an arms race in which each additional dollar buys less and less political influence as the total contributions increase.

This paper investigates some mechanisms that explain how income and income inequality affect political contributions. There are two goals here. One is to show how changes in income and income inequality can affect political contributions in different, and sometimes opposite, ways. Intuition tells us that they should operate differently, but the well-known positive cross-sectional correlation of contributions and income only suggests one way. The second is to specify the empirical tests that might distinguish the
impacts of income and income inequality. Thus, the aim is to determine the proper specification of a political contributions equation such as:

\[
\text{Political Contributions} = \alpha + \beta \text{ Income} + \delta \text{ Inequality} + \theta \text{ Controls} + \text{error}.
\]

This paper will provide insights about how to measure income and inequality, the expected signs of $\beta$ and $\delta$, whether to add an interaction term of income and inequality, and the identity of other variables that affect political contributions.

The goal is not to develop a full-fledged, theoretically detailed model of political contributions. There is a need for such models, but it is often hard to relate them to empirical work, and a fully developed model will probably involve a number of different mechanisms, thus making it hard to get at the heart of the process. The goal here is to obtain insights into how empirical work on political participation should proceed. Consequently, the model is very simple and transparent, and special attention is paid to empirical specification.

We show that income and income inequality, while necessarily closely linked in any model, nevertheless can have distinctly different kinds of impacts on political contributions. We also show that different strategies must be used to study the impact of income on political contributions and the impact of economic inequality on political contributions. And we show that special care must be taken in specifying ceteris paribus assumptions when making assertions about the impact on income inequality on political participation. Although these results follow from the particular, rather simple, model that we propose, there are good reasons to believe that the same problems would arise in any model of political contributions. Hence, the model surely captures insights that any empirical work must heed.

**Reasons for Giving** – The model in this paper emphasizes a narrow self-interest motive for political contributions. Other motives might be considered as well. One possible motive is a “taste for charity;” that is, a desire to “do good.” Political giving might be like charitable giving and because charity is a normal good, the rich contribute more. This approach “explains” why the rich give more by assumption, and it provides no predictions about the impact of economic inequality on political giving. In addition, it does not easily explain the following empirical result from Verba, Schlozman, and Brady (1995). In Figure 1, the percent of income given to religion, charity, and political campaigns is plotted by income level. Whereas religious giving declines with income (primarily because the rich are less likely to attend church) and charity increases somewhat with income, political giving increases very substantially and non-linearly with income. If political giving is like charity, why does it have such a different pattern than charity itself? The data do not support the idea that political giving is just like charitable giving.

Another possible motive for political giving is a pure consumption motive, simply “a desire to become involved in politics.” In this case, the joy of working with others in a common political pursuit motivates people to make contributions. But if this is the goal,
wouldn’t it make more sense to give time in the form of volunteer work to political campaigns? How can political contributions provide a sense of working with others? Perhaps the answer is that money raising campaign events are designed to provide this feeling of common purpose and working together. And the rich give money instead of time to politics because the marginal value of time is much greater to them than the marginal value of money. This theory, with some effort, might go some way towards explaining the pattern of people giving time and money, but it tells us nothing about how income inequality could have an impact beyond its effect on the relative incomes of various groups.

A third explanation might be informational asymmetries. Perhaps the rich “know more about politics” than the poor which causes them to give more money to politics. Certainly the rich are better educated than the poor, and they know much more about politics. This theory might very well be part of any complete explanation of money and politics, but does not tell us the basic animating force for political contributions. Informational asymmetries could magnify pre-existing reasons one way or another, but they cannot provide the basic explanation for political contributions.

A fourth explanation might be “interdependent utility functions” such as envy and jealousy. Just as the “taste for charity” or “a desire to become involved in politics” motives provide some insight into why those with more income make more contributions, this explanation provides some insight into why economic inequality might matter. If those with less income envy those with more, then economic inequality will affect behavior. But what behavior will be affected? Unless this approach is combined with some mechanism whereby envy is turned into political action, it does not go vary far.

**A Simple Model of Political Contributions**

It seems best to begin with a mechanism that indicates why political contributions might be linked in a directly self-interested fashion to outcomes such as income and income inequality. Legislative vote buying models (e.g., Groseclose, 1996; Groseclose and Snyder, 1996) do this by assuming that people trade resources such as money for favors provided by a legislature. None of these models says much about income or income inequality directly, but they do suggest that one of the features of a successful model of political participation is that it must incorporate a self-interested purpose for participation such as garnering favors.

In this paper, a model is presented with $N$ income groups whose gross income is generated by some process outside the model. In the model, government taxes away a portion of this income through an exogenously determined proportional tax on all income above an income “disregard.” Income groups then compete for a share of the resulting tax revenue by making political contributions.

The model shows that income and income inequality operate in different ways, and it provides comparative static predictions about what happens with changes in the income
distribution or the tax system. Among other things, the model demonstrates the complexity of ceteris paribus assumptions that must be made to make inferences about the impact of income and income inequality on political participation. The paper ends by exploring various research designs for evaluating the impact of income and income inequality on political participation.

**Income and Income Inequality in the Model** -- Consider a model with \( N \) classes, called \( j=1,\ldots,N \), each with different gross income, \( Y_j \), with \( Y_j < Y_k \), for \( j<k \), so that the lower number class \( j \) has less gross income than the higher number class \( k \). Assume that the height of the income step from one class to the next is constant such that \( Y_j - Y_{j-1} = S \). This recursive relationship implies that income for any class can be expressed in terms of the lowest income \( Y_1 \), the class’s income step number \( j \), and the height of the step \( S \) which produces it: \( Y_j = Y_1 + (j-1)S \). The overall income distribution is then described by the lowest income, the total number of classes or steps \( N \), the height of the steps, and the fraction \( L_j \) of people in each class \( j \).

Dividing the income distribution into classes in this way provides a useful way of describing the income distribution, but it does much more than this. In the model described below, classes act corporately to compete over government revenues – classes are like firms in a model of competition. If there is just one class, then it has a monopoly over government revenues. If the number of classes is small, then the result is similar to oligopolistic competition. And if there are many classes, then the result is like perfect competition. The existence of income classes and their behavior as corporate entities are the basic sociological facts of this model, just as the existence of firms is the basic sociological fact on which the theory of market competition is based. It is important to know why classes exist and why they might act in a unified way, but that is not the basic aim of this paper – just as the basic point of most elementary work on the theory of markets is not to ask why firms exist and why they act corporately. Of course, the existence of classes may be more problematic than the existence of firms. Classes do not have legal standing like corporations, and it is not obvious what forces would cause them to act corporately, although labor unions and political parties might be two important mechanisms. We return to this problem towards the end of the paper, but for the moment, we shall simply assume that classes are a basic sociological feature of our model.

Individual income is represented by \( Y_j \), and income inequality in the society is fully described by four of its features: the lowest income \( Y_1 \), the total number of classes or steps \( N \), the height of the steps \( S \), and the fraction \( L_j \) of people in each class \( j \). It will be useful to have a way to summarize the characteristics of the income distribution. As with any distribution, the mean and variance seem like good places to start. The average income, \( Y_\cdot \) in the society is the following, where we use the recursive relationship for income described above:

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1 Alternatively we could assume that \( L_j \) is the number of people in each group, but it is convenient to work with fractions because then the sum over all fractions equals one, \( \sum L_j = 1 \), thus simplifying many formulas.
\[ Y_+ = \left[ \sum_k L_k Y_k \right] / \left[ \sum_k L_k \right] = \sum_k L_k \left[ Y_1 + (k-1) S \right] \]
\[ = Y_1 + S \left[ \sum_k \left[ (k-1) L_k \right] \right] = Y_1 + S Q. \]

In the last equality, \( Q = \sum_k (k-1) L_k \). If the lowest income \( Y_1 \) equals the income step \( S \) then \( Y_+ = S (Q+1) \), and \( Q+1 \) is the weighted mean\(^2\) of the class numbers, \( \sum_k k L_k \).

The value of \( Y_+ \) in two special situations is of interest. First, if the income distribution is equal, and everyone is in the \( j \)th income class so that \( L_j = 1 \) (and \( L_k = 0 \) for all \( k \neq j \)), then \( Q \) equals \((j-1)\). Second, if the income classes are equal sizes so that \( L_k = 1/N \), then \( Y_+ \) is at the midpoint \((Y_1+S(N-1)/2)\) between \( Y_1 \) and \( Y_N \).

The variance of income, which is one measure of inequality, is the following:

\[ \text{Var}(Y) = \left[ \sum_k L_k (Y_j - Y_+)^2 \right] / \left[ \sum_k L_k \right] \]
\[ = \sum_k L_k \left\{ [ (k-1) S + Y_1 ] - [ S Q + Y_1 ] \right\}^2 = S^2 \left\{ \sum_k L_k \left[ k - (Q+1) \right] \}^2\right\}, \]

where the quantity in braces only depends upon the distribution of the \( L_k \). Note that if everyone is in the \( j \)th income class, then \( L_j = 1 \) (and \( L_k = 0 \) for all \( k \neq j \)) and \( Q = j-1 \) so that \( \text{Var}(Y) \) will be zero. But the variance will be positive otherwise.

The variance can increase because of increases in the intervals \( S \) between income classes, or because of changes in the fraction \( L_k \) of people in each income class. The intervals will change if there is a proportionate increase in incomes. Thus, if \( Y_k^\# = \eta Y_k \) for all \( k \), then \( S^\# \) will equal \( \eta S \) because by the definition of income class, \( Y_k^\# - Y_{k-1}^\# = S^\# \) and \( Y_k - Y_{k-1} = S \). As a result, \( \text{Var}(Y^\#) \) will be larger than \( \text{Var}(Y) \) by \( \eta^2 \). Most writers on inequality believe that the variance is not a good measure of inequality because it increases in this way when everybody is given the same proportionate increase in their income.

Consequently, the coefficient of variation is often used as a measure of inequality in which the square root of the variance of income, its standard deviation, is divided by its mean:

\[ \text{CV}(Y) = \text{Coefficient of Variation}(Y) = S \left\{ \sum_k L_k [k - (Q+1)]^2 \right\}^{1/2} / [S Q + Y_1] \]

This measure does not change when there is a proportionate change in all incomes (including \( Y_1 \)). Therefore, it is convenient to write \( Y_1 = \psi S \) (with \( \psi \) greater than zero) so that the coefficient of variation can be written with one fewer parameter:

\[ \text{CV}(Y) = \text{Coefficient of Variation}(Y) = \left\{ \sum_k L_k [k - (Q+1)]^2 \right\}^{1/2} / [Q + \psi] \]

\(^2\) The quantity \( Q \) can be thought of as the sum of the fractional size of each income class weighted by the size of its income, in \( S \) units, beyond the income \( Y_1 \) of the lowest class \( k=1 \). Thus, for example, class three’s income \( Y_3 \) in excess of \( Y_1 \) is twice the size of class two’s income \( Y_2 \) in excess of \( Y_1 \) so the size \( L_3 \) of class three is weighted by the quantity \((j-1) = 3-1 = 2\) or twice the amount of class two.
If \( Y_1 = S \), then \( \psi = 1 \), and the coefficient of variation takes an especially simple form:
\[
\left\{ \sum_k L_k (k - (Q+1))^2 \right\}^{1/2} / (Q+1)
\]
which is the weighted standard deviation of the class numbers over their weighted mean.\(^3\)

Remembering that \( Q \) is a function of the \( L_k \), increases in the coefficient of variation can occur in only two ways. One way is by changing the incomes for the income classes by changing the ratio \( \psi \) of the lowest income to the income step. The other is to change the size of the income classes by making changes in the set of parameters \( L_k \) which describe the fraction of people at each income level.

Consider the first approach that changes the incomes for the income classes. A decrease in the ratio of the lowest income to the income step (a reduction in \( \psi = Y_1/S \)) will clearly increase the coefficient of variation. A decrease in \( \psi \) can occur because the lowest income \( Y_1 \) decreases while the income step \( S \) remains the same or because \( Y_1 \) stays the same while the income step \( S \) increases. In the first case, the mean income \( Y_+ = SQ + Y_1 \) will clearly decrease as well. In the second case, the mean income will increase. There must therefore be a way to choose \( Y_1 \) and \( S \) such that \( \psi \) decreases and the mean \( Y_+ \) remains the same.\(^4\) This mean preserving change in \( \psi \) will therefore unambiguously increase income inequality based upon Atkinson’s (1970) results which showed that a mean preserving spread leads to a more unequal income distribution (a less socially preferred distribution) in the very general situation where there is a social welfare function that is additively separable, symmetric, and increasing and concave.\(^5\)

Another way to increase inequality would be to keep the income categories the same while moving people away from those income categories around the average income towards the bottom and top categories. This amounts to changes in the \( L_k \) which would generally lead to changes in the average income. But if the \( L_k \) are changed by moving people away from the average income towards the top and bottom categories while keeping the bottom income, the income step, and average income the same, then \( Q \) must remain constant as well (see equation (1)), and the variance, and the coefficient of variation, will clearly increase. Because it is unwieldy to deal with \( (N-I) \) independent \( L_k \) values, we formulate a one parameter equation for income distribution later in the paper.

**Government, Taxation, and Political Contributions in the Model** – Competition over the allocation of government revenues is the basic driving force in this model. Government raises revenues through a proportional tax \( t \) on all income above some disregard level \( Y_D \). A person in group \( j \) pays no taxes if \( Y_D > Y_j \) and taxes of \( t(Y_j - Y_D) \) otherwise. If we define the dummy variable \( D_j \) to be zero if \( Y_D > Y_j \) and one otherwise then the tax receipts from person \( j \) are \( tD_j(Y_j - Y_D) \).

\(^3\) A little more algebra yields: \( \text{CV}(Y) = \left\{ \sum_k k^2 L_k /(Q+1)^2 \right\}^{1/2} - 1 \)

\(^4\) That is, we have that \( Y_+ = SQ + Y_1 \) and \( Y_1 = \psi S \) so that with \( Q \) and \( Y_+ \) fixed and \( \psi \) decreased, we can choose \( S \) to satisfy the first equation and then we can choose \( Y_1 \) to satisfy the second equation.

\(^5\) It also leads to a Lorenz curve for the new distribution that is everywhere below (more unequal) than that for the original distribution.
The per capita share of total tax receipts for the class \( j \) is the product of the tax receipts from a typical member of the class \( tD_j(Y_j - Y_D) \) times the class’s share of the population \( L_j \) which produces \( tD_j L_j(Y_j - Y_D) \). We can write the per capita tax receipts for all classes as follows:

\[
(5) \quad r = t \sum_k D_k L_k (Y_k - Y_D).
\]

The total revenues are \( R = Mr \), where \( M \) is the total population.\(^6\) As long as the disregard is positive, this tax is progressive with a zero tax rate on income below \( Y_D \) and a tax rate of \( t \) on income above that level.

The government returns tax receipts to the members of each group in proportion to the amount of political contributions given by the group. Each group chooses a common contribution for members, \( c_j \) for group \( j \). The per capita contributions for the population\(^7\) are:

\[
(6) \quad c = \sum_k L_k c_k.
\]

The total contributions are \( C = Mc \). The proportion of political contributions for a member of group \( j \) is \( c_j/C \). Each person obtains this proportion of the total tax revenues which amounts to \( (c_j/C)(R) = [c_j/Mc][Mr] = c_j/r \). The total proportion of political contributions by a group is \( C_j/C \) where \( C_j = ML_j c_j \).

A group member’s net income \( Y_j^* \) is his gross income \( Y_j \) minus his taxes, plus the fraction of tax revenues that he recovers, minus his political contributions:

\[
(7) \quad Y_j^* = Y_j - t(Y_j - Y_D) + (cjr/c) - c_j.
\]

The equilibrium concept here, as in a standard Cournot oligopoly model, is Nash equilibrium, and groups choose their contributions by selecting \( c_j \) so as to maximize \( Y_j^* \) assuming that all other contributions are fixed. The first order conditions\(^8\) for this are (remembering that contributions are a function of one’s own contributions):

\[
(8) \quad r/c - c_j rL_j/c^2 - 1 = 0, \text{ for all } j.
\]

With a little rearrangement, we get:

\[
(9) \quad c_j L_j = (rc - c^2)/r
\]

---

\(^6\) Because the \( L_j \) are the fractions of the number of people in each class (equal to the number of people in each class \( M_j \), over the total number of people in the population \( M \)), \( r \) equals the per capita tax receipts. The total tax receipts can be computed by multiplying \( r \) by the population \( M \) because from (4): \( Mr = t \sum D_j ML_j (Y_j - Y_D) = t \sum D_j M_j (Y_j - Y_D) = R \).

\(^7\) As in the footnote above, total contributions can be obtained by multiplying \( c \) by the population \( M \) to get \( Mc = \sum ML_j c_j = \sum M_j c_j \).

\(^8\) We assume that the solutions for individuals are never larger than their gross incomes after taxes. This is a reasonable starting place for this model, and it seems likely that contributions are typically within the range of people’s gross income.
Because this must hold for all \( j \) and because the right-hand-side is constant for all \( j \), it must be true that in equilibrium the total contributions by each class are equal:

\[
(10) \quad c_j L_j = c_k L_k.
\]

We discuss the intuition for this condition below.

With this expression, we can write the contributions equation (6) as follows:

\[
(11) \quad c = N L_j c_j.
\]

Hence, equation (9) above can be written as:

\[
(12) \quad c_j L_j = \frac{r NL_j c_j - N^2 L_j^2 c_j^2}{r},
\]

which we can solve for \( c_j \):

\[
(13) \quad c_j = \frac{[(N-1)/N^2] r/L_j}.\]

**Contributions Inversely Related to the Size of the Income Class** – Both equations (10) and (13) show that the ratio of contributions for any two income classes is inversely related to the size of the income classes:

\[
(14) \quad c_j/c_k = L_k/L_j.
\]

Thus, those in income classes with more people provide smaller contributions. Note that this formula does not include the size of people’s income; that is, \( Y_j \) and \( Y_k \) do not appear. This result is quite surprising because it shows that political contributions are determined by the shape of the income distribution; not by one’s individual income. Therefore, this model suggests that the often noted positive correlation between political contributions and income results from the fact that lower income classes are larger than upper income classes. In a society in which upper income classes were larger than lower income ones, then lower income people would give more money.

Note that the per capita contributions are:

\[
(15) \quad c = \sum_k L_k c_k = \sum_k L_k \left[ (N-1)/N^2 \right] r/L_k = R \left[ N(N-1)/N^2 \right] r = r (N-1)/N
\]

Hence, the ratio of total political contributions \( C = Mc \) to total tax revenues \( R = Mr \), which might be thought of as a measure of the deadweight loss of the political system, is:

\[
(16) \quad C/R = c/r = (N-1)/N.
\]

This deadweight loss clearly increases with the number of income classes. When there is one income class so that \( N=1 \), the deadweight loss equals zero because the monopolistic
class simply gets all the revenue back without any contributions at all. When there are two income classes so that N=2, the deadweight loss is one-half. When there are ten income classes, the loss is .90. With a very large number of income classes, the loss is essentially one. In effect, political competition through political contributions among a large number of classes competes away the revenues into the political sphere.

**Intuitions for the Model** – The best way to think about how condition (13) comes about is to consider a situation with two classes. If one class makes some small contributions, but the other does not, then the first class will get all the revenues for a relatively small contribution. Clearly it makes sense for the second class to make some contributions as well. If the second class matches the first in total contributions, then it gets half the revenues. Matching makes sense as long as the contribution yields more in revenues than it costs, but matching does mean that the value of the first group’s contributions has been halved – the first group initially got all the revenue for its contributions, but now for the same contributions it gets half the revenues. At this point, the first group might increase its contributions to augment its share, although at the margin, each dollar it spends is only worth \((1/2)R/C\) in revenues recovered, which will only be a reasonable return, namely a dollar or more, if the ratio of revenues to contributions is greater than or equal to two. It is easy to see why this is so.

If we let \(C_j\) represent the contributions of group \(j\) so that \(C_j = c_j L_j\), then \(C = C_1 + C_2\).

Each group gets a proportion \(L_j/c_j\) of the revenue \(R\). Now, assume that group one gives \(\epsilon\) more contributions. Then, the total contributions become \(C^* = C_1 + \epsilon + C_2\) and the proportion of the revenues obtained by group one is \((C_1 + \epsilon)/C^*\). Thus, the gross gain in revenues for this class is \((C_1 + \epsilon)R/C^* - C_1R/C\). A little algebra shows that this is equal to \(\epsilon(C_1 - \epsilon)R/CC^*\) and this must be greater than \(\epsilon\) to make a contribution worthwhile. That is:

\[
\epsilon(C_1 - \epsilon)R/CC^* \geq \epsilon \Rightarrow (C_1 - C_1)R \geq CC^*.
\]

Because \(\epsilon\) is small, \(C\) is approximately equal to \(C^*\) so that after some algebra we can write that group one should contribute as long as:

\[
(18) \quad C_2/C \geq C/R.
\]

It makes sense for group one to contribute more only if the other group’s share of contributions is greater than total contributions as a fraction of total revenues. If total contributions are small (so that \(C/R\) is small), and if group two’s contributions are a large fraction of the total contributions, then group one should contribute to “catch-up.” As it catches up, total contributions increase, thus increasing the right-hand-side, and the relative fraction of group two’s contributions decreases, thus decreasing the left-hand-side, so that eventually equality will be reached.

There is a similar equation for group two:

\[
(19) \quad C_1/C \geq C/R.
\]
Group two will follow a similar strategy of trying to match its share of the contributions to the ratio of contributions to revenues. Since both equalities must hold in equilibrium, \( C_1 \) must equal \( C_2 \), in which case the left-hand side of each inequality is \( 1/2 \).

Consequently, in equilibrium, \( C/R \) must be \( 1/2 \) so that total contributions are one-half of revenues. At this point, \( \varepsilon \) more in contributions will yield slightly less than \( \varepsilon \) in benefits because, by the equation above, the net benefits when \( C_1 = C_2 \) and \( C/R = 1/2 \) will be equal to \((C_E - C_j)R/CC^* = C_E/C^* \) which will be less than \( \varepsilon \) because \( C^* \) is bigger than \( C \). Therefore, there will be no incentive for either party to deviate from this equilibrium.

When \( N \) is greater than two, the same logic applies, except that the contributions rule for group \( j \) is to contribute as long as:

\[
\sum_{k \neq j} C_k/C \geq C/R.
\]

In this case, it is worthwhile for group \( j \) to contribute more as long as the fraction of the contributions from everyone else is greater than the ratio of contributions to revenues. This drives up contributions until the point where the total is \((N-1)/N \) of revenues. When \( N \) is large, each class is faced with the problem of competing with many other classes, and its ability to control the arms-race of contributions is limited by its small share of the total contributions. The result is similar to many firms competing away profits that are available in the more controlled environment of oligopoly.

**Adding Assumptions about the Income Distribution**

The Pareto Distribution -- The use of the fractions \( L_j \) to describe the income distribution provides for very great generality, but it introduces too many \((N-1)\) parameters for comparative static analysis of changes in the income distribution. Ideally, we would like to have some small number of parameters, preferably only one, for describing the income distribution. This suggests that we use some parametric form. A great variety of forms have been suggested (Dagum, 1996), but a very suitable one for this model is the Pareto distribution first suggested by Vilfredo Pareto in 1896 (see Creedy, 1977). The Pareto is a strictly decreasing continuous distribution with a very thick tail and effectively one shape parameter \((\alpha > 1)\). The density function is:

\[
f(x) = \alpha x_0^\alpha x^{\alpha-1}
\]

for the range \( x = (x_0, \infty) \) where \((x_0 > 0)\) is called the ‘minimum income.’ The Pareto has a mean of \([\alpha x_0/(\alpha - 1)]\) if \( \alpha \) is greater than one, otherwise the mean is undefined which is why \( \alpha \) is restricted to be greater than one. If \( \alpha \) is greater than two, then the distribution has a variance of \([\alpha x_0^2/(\alpha - 1)^2(\alpha-2)]\). Empirically, \( \alpha \) is typically between 1.1 and 3.5. (Creedy, 1977).
For most studies the Pareto has the defect that it does a much better job of describing the right-most or higher income, tail of the distribution than the left-most or lower income part of the distribution. The left part of the distribution sometimes reveals an increasing frequency of people until it reaches a mode at moderate incomes from which the distribution descends according to a Pareto distribution. As a result, the lognormal distribution which is skewed to the right, has a mode at moderate incomes, and descends to zero on the left is sometimes preferred (Aitchison & Brown, 1954).

Nevertheless, the Pareto seems preferable here for several reasons. First, and most importantly, political contributions are disproportionately given by those with high incomes so it is important to capture their behavior. To a first approximation, we can probably neglect those at the lowest end of the income spectrum, although it is the nature of the model developed here that we do not want to neglect moderate and middle income people. The Pareto distribution seems to capture that part of the distribution. Second, the Pareto has the virtue of being primarily characterized by one shape parameter and another parameter for “minimum” income. The lognormal requires at least two parameters, and it is often written with a third parameter to capture a minimum income. Third, the Pareto has the very useful property that a proportional increase in everyone’s income (or even a change in units from dollars to pounds) produces a distribution with the same shape parameter and only a proportional change in the minimum income parameter, whereas the lognormal and some other distributions do not have this property. Thus, the Pareto is essentially independent of scale whereas other distributions are not.

**Discrete Bounded Pareto Distribution** -- With a finite number of income classes in this model, the Pareto has to be modified to be a discrete distribution. A flexible discrete distribution that is closely related to the Pareto distribution is:

\[(22) \quad L_j = (jL)^\delta / N,\]

where \(j\) is class number and \(L\) and \(\delta\) are parameters. The parameter \(L\) must be greater than zero because no income class can have a negative share of the population and at least one class must have a positive share. If \(\delta\) is greater than zero, then \(L_j\) increases with \(j\) and the richer classes are larger than the poorer ones, and if \(\delta\) is less than zero, then \(L_j\) decreases with \(j\) and the poorer classes are larger than the richer ones. If \(\delta\) equals zero, then the \(L_j\) all equal \(1/N\).

Because the \(L_j\) must always be non-negative and sum to one, the constant \(L\) must be positive and it must satisfy the following equation:

\[(23) \quad \sum_k L_k = \sum_k (kL)^\delta / N = 1,\]

which implies that:

\[(24) \quad L^\delta = N / \sum_k k^\delta.\]

Hence, we can write \(L_j\) as follows in terms of income class \(j\):
Figure 2 shows what these distributions look like for seven different values of $\delta$ (-3, -2, -1, 0, 1, 2, 3) and two values of $N$ (5 and 10). Note that within each panel, the income distributions are skewed to the right for negative values of $\delta$ with most of the population in the lower income classes on the left, and they are skewed to the left for positive values of $\delta$ with most of the population in the higher income classes on the right. When $\delta=0$, the population is spread equally across the income classes. Roughly speaking, it appears as if there is less income inequality when $\delta$ is highly negative or highly positive, but it is hard to be sure. Across the two panels, it appears as if there is more inequality when there are more income classes.

With these results, we can write the mean of the distribution, using (1) as:

\[
Y_\lambda = \sum \frac{k^\lambda}{\sum k^\lambda}.
\]

Figure 2 shows what these distributions look like for seven different values of $\delta$ (-3, -2, -1, 0, 1, 2, 3) and two values of $N$ (5 and 10). Note that within each panel, the income distributions are skewed to the right for negative values of $\delta$ with most of the population in the lower income classes on the left, and they are skewed to the left for positive values of $\delta$ with most of the population in the higher income classes on the right. When $\delta=0$, the population is spread equally across the income classes. Roughly speaking, it appears as if there is less income inequality when $\delta$ is highly negative or highly positive, but it is hard to be sure. Across the two panels, it appears as if there is more inequality when there are more income classes.

With these results, we can write the mean of the distribution, using (1) as:

\[
Y_\lambda = S \left[ (\psi - 1) + \frac{\sum (k^\lambda + 1)}{\sum k^\lambda} \right].
\]

Note that average income increases with $S$ and $\psi$ (assuming that $S$ stays fixed so that only $Y_\lambda$ is really increasing), but the relationship with $\delta$ appears to be more complicated. In fact, average income always increases with $\delta$. The mathematical proof is quite messy, but a glance at Figure 2 reveals the intuition. As $\delta$ increases, people are always being moved from the lower parts of the income distribution to the higher parts. As we move from lower to higher $\delta$, each curve is below the preceding one on the left-hand side of the figure until it intersects the preceding one and then remains above it from then on.\footnote{The mathematical proof relies upon the following facts. If we increase $\delta$ by a positive quantity $\varepsilon$, then $k^{\delta+\varepsilon}$ will always be greater than or equal to $k^\delta$ for $k = 1, ..., N$. Thus, each of the numerator terms in the new distribution $L_* = k^{\delta+\varepsilon}/\sum k^{\delta+\varepsilon}$ will be greater than or equal to the numerator terms in the old distribution $L =^{\delta}/\sum k^{\delta}$. Furthermore, this increase in the numerator terms will be larger as $k$ increases because $(k+1)^{\delta+\varepsilon}/k^{\delta+\varepsilon}$ is greater than $k^{\delta+\varepsilon}/k^{\delta+\varepsilon}$. This inequality readily leads to the conclusion that $L_{k+1}/L_k > L_{k+1}/L_k$. Now assume that $L_1 > L_1$. If this were true then all $L_k > L_1$. But this is impossible because the $L_k$, like the $L_k$, must sum to one. Hence, $L_k \leq L_1$. In fact, it is easy to see that we must have $L_k > L_1$. Now suppose that $L_k < L_1$. We encounter a similar problem and we must have $L_N > L_N$. This can be repeated to show that at some intermediate $k$, the inequality between $L_k$ and $L_N$ reverses. Hence, with an increase in $\delta$, some of the population is moving from the lower income classes to the upper ones – hence increasing the mean income.}

We can write the CV as follows in terms of three parameters, the number of income classes $N$, the distributional shape parameter $\delta$, and the ratio of the lowest income to the income step $\psi$.

\[
CV = \frac{\sum k^{\delta}\sum_k k^{\delta+2} - (\sum k^{\delta+1})^2}{\sum k^{\delta+1} + (\psi - 1)\sum k^{\delta}}.
\]

Figure 3 shows how the values of the CV change for various values of $N$ as a function of $\delta$ when $\psi$ is set to one so that the initial income equals height of the income step. This picture provides a clear picture of how income inequality changes with $\delta$, although we
must be careful in interpreting what it means. As δ increases, the mean income increases as well. Under these circumstances, we can interpret a decrease in the CV as an increase in equality (because the share of the pie has increased and the variance has gone done), but we cannot readily interpret an increase in the CV. We can, however, perform the following trick. We can adjust the income step S in (26) downwards just enough to bring the mean income back to where it was, and then we can examine how this affects the CV in (27). If we make this adjustment without affecting ψ by adjusting the lowest income level $Y_1$ downwards as well, then the CV will be the same as before adjustments were made in the mean income. Therefore, when the CV increases with increases in δ, we can use it as a measure of comparative income inequality by taking advantage of these adjustments. If N and δ stay the same, but ψ increases, then CV will decrease. Because mean income also increases, inequality will clearly decrease.

With these results we can interpret the curves in Figure 3. Clearly inequality increases with the number of income classes. In fact, as the number of classes goes to infinity, the curve gets higher and higher on the right hand side of the diagram until it has no mean between δ = (-2, ∞) and no variance between δ = (-3, ∞) so that the CV is undefined for these values. The remaining curve will decline from an infinite value for the CV at δ=3 down towards a zero value for δ=-∞. This curve for the CV for the continuous Pareto distribution is very close to that for the truncated Pareto for large N with δ = -(α +1).

The curves for a finite number of income classes, however, always have defined CV’s. The CV declines to the right of δ=-1 and it declines to the left of δ=-2. Hence, the CV increases with δ to a maximum between (-2,-1) depending upon the number of classes, and then it decreases from then on. Empirically the most likely values of δ are in the range (-2,-5) where the CV is clearly increasing with δ.

These results, however, are for the case where ψ is set to one. In order to do comparative statics, we want to know under what conditions CV is increasing and when it is decreasing. This amounts to asking the value of δ, call it $\delta_{\text{MAX}}$, where the CV has its maximum for various values of N and ψ. Figure 4 plots $\delta_{\text{MAX}}$ as a function of ψ for N=2, 5, and 10. The vertical line indicates where ψ=1, that is where the ratio of the lowest income to the income step is one. It seems likely that the reasonable values of ψ are between .2 and 4 – in the first case, the lowest income is only one-fifth of the income step; in the second case the lowest income is four times the income step. In this range, $\delta_{\text{MAX}}$ is between -3 and -.3. Hence, in most of the empirically observed ranged for δ between (-2 and -5), the CV is increasing with δ. That is, inequality increases with δ.

**Results from the Model**

**Summing up the Model So Far** – The basic equations are the following:

The *contributions equilibrium* which is a function of the number of income classes N, the shape of the income distribution determined by δ, and tax revenues per capita $r$.

\[
c_j = [(N-1)/N^2] \cdot r \cdot \frac{\sum k^\delta}{j^\delta}.
\]
If we take the logarithm of this equation we can write it as the following equation:

\[(29) \log(c_j) = \log[(N-1)/N^2] + \log(\sum_k k^\delta) + \log(r) - \delta \log(j).\]

In a cross-section of people who are all in the same political system, only \(c_j\) and \(j\) will vary from person to person, and the correlation between political contributions and income class will be positive only if \((-\delta)\) is positive – if \(\delta < 0\), which is what we find empirically. If we have a cross-section of people across political systems, then \(N, \delta,\) and \(r\) could vary as well, and we would have to control for all of them. Over time within the same political system, we might expect that \(\delta\) and \(r\) would change as well, in which case we would have to take that into account in any estimation procedure.

The revenue equation which is a function of the tax rate \(t\), a dummy variable \(D_k\) indicating whether the income of a class falls within the taxable range, the shape of the income distribution determined by \(\delta\), the income of each class \(Y_k\), and the income disregard \(Y_D\):

\[(30) \quad r = t \sum_k D_k k^\delta (Y_k - Y_D)/[\sum_j j^\delta].\]

The income equation which defines the income of class \(j\) in terms of the \(\psi\) ratio of the minimum income to the height of the income step, and the height of each income step \(S\):

\[(31) \quad Y_j = \psi S + (j-1)S.\]

The characteristics of the income distribution are defined by its mean \(Y_+\) and coefficient of variation \(CV\):

\[(32) \quad Y_+ = S \left\{(\psi-1) + (\sum_k k^{\delta+1}/\sum_k k^\delta)\right\},\]

\[(33) \quad CV(Y) = [\sum_k k^\delta [\sum_k k^{\delta+2} - (\sum_k k^{\delta+1})^2]^{1/2}/[\sum_k k^{\delta+1} + (\psi-1)\sum_k k^\delta].\]

**Summing up Results So Far** – The results so far include the following. First, equation (13) shows that per-capita contributions are inversely related to the size of the group. This implies that if the size of an income class decreases with income, then contributions increase with income. For the specific case where the discrete Pareto distribution is used to model the income distribution, equation (29) shows that the value of \(\delta\) determines the relationship between contributions and income, and when \(\delta\) is negative (so that the size of income classes decreases with income) this relationship is positive.

Second, for distributions with enough right-skew, per-capita contributions increase progressively with income. Consider how the ratio of contributions to income changes with an increase in income (where we have used \(j\) to index income) for the discrete Pareto distribution:

\[(34) \quad \frac{\partial(c_j/j)}{\partial j} = \delta(\{(N-1)/N^2\} r [\sum_k k^\delta] / j^{\delta+1})/\partial j = -(\delta+1) c_j/j^2.\]
Clearly the sign depends upon the value of \( \delta \) and for values of \( \delta \) less than -1, this proportion increases with income. As noted earlier, most empirical work obtains values of \( \delta \) that are less than -2. Figures 5 and 6 illustrate this result. In Figure 5, the top panel graphs a right skewed income distribution with \( \delta = -2 \) and \( \psi = 1 \), and the lower case plots the ratio of per-capita contributions \( c_j \) to per-capita revenues \( r \) for each class versus income. Note that this ratio increases with income at an increasing rate so that per-capita contributions increase progressively with income. Figure 6 presents the same analysis for a left-skewed income distribution with \( \delta = 2 \) and \( \psi = 1 \). In this case, per-capita contributions decrease with income.

Third, the ratio of total contributions to total revenues is equal to \( (N-1)/N \) so that the deadweight loss of politics increases with the number of classes.

**More Comparative Statics** – With these results and equations for the model, we can explore what happens when some of the basic parameters are modified. We begin by considering what happens to contributions under various scenarios. It is especially easy to do some analysis if we assume that revenues are fixed in the contributions equation. This can be done by assuming that in the revenues equation, as various parameters of the model change, the tax rate is always adjusted to keep revenues constant. Since the tax rate appears only in the revenue equation, but not in the contributions equation, it is obvious that we can adjust revenues in this way. With this assumption, we can see what the impact is on contributions of a change in the income distribution. The parameter for this in the contributions equation is \( \delta \). If we take the derivative of the contributions equation with respect to \( \delta \) while keeping \( r \) constant at \( r^* \), we get the following:

\[
\frac{\partial c_j}{\partial \delta} \bigg| r=r^* = \left[ r^* \frac{(N-1)}{N^2} \right] j^\delta \left[ \sum_k \ln(k/j) \right] k^\delta.
\]

And for the lowest class, \( j = 1 \), and the highest class, \( j = N \), this is the following:

Lowest Class: \( \sum_k \ln(k) \) \( k^\delta > 0 \).

Highest Class: \( \sum_k \ln(k/N) \) \( k^\delta < 0 \).

Remember that in the empirically typical case where \( \delta \) is less than about minus two or minus three, an increase in \( \delta \) indicates that the distribution of income is more unequal. In this case, the results above suggest that an increase of inequality leads to more contributions by the lower classes but fewer contributions by the upper class. If \( \delta \) is greater than minus one, then the reverse occurs. As inequality increases, there are fewer contributions by the lower classes, but more contributions by the higher class.

These results are interesting, but when we change \( \delta \) we are increasing the average income which means that if the tax rate were kept the same, then revenues would typically change. When \( \delta \) delta is less than about minus two, the general shape of the income distribution is that it decreases from a large number of people in the lowest income class to a smaller and smaller fraction of people in each subsequent income class. When \( \delta \) is very negative, virtually everyone is in the lowest income class and there is virtually no
inequality—although the mean income level is low. An increase in $\delta$ moves people from the higher income classes to the lower ones. As a result, the variance in the income distribution increases, and the mean increases as well. The net result is an increase in inequality. The impact on revenues is complicated in this case, but in a progressive tax system, an increase in the mean income always means that revenues must increase as long as the disregard is below the mean.

To determine the impacts, it helps to start by considering a proportional tax for which the disregard $Y_D=0$. Then it is easy to see (and to show) that $r = t Y_+$. Hence, if the tax rate stays constant, per capita revenues $r$ increase by the tax rate $t$ times the average income $Y_+$. The complete derivative of contributions with respect to $\delta$ in this case is then:

$$ (36) \quad \frac{\partial c_j}{\partial \delta} = \left[ \frac{r (N-1)}{N^2} \right] j^{\delta} \left[ \sum_k \ln(k/j) k^{\delta} \right] + \left[ \frac{(N-1)}{N^2} \right] j^{\delta} t \left[ \sum_k k^{\delta} \right] ( \partial Y_+/\partial \delta). $$

For $j=1$, it is obvious that an increase in $\delta$ will always lead to an increase in contributions because the first term is positive (as shown above) and the second term is positive. The interesting case is when $j=N$. In this case the first term is negative and the second is positive. What is the net result? Algebra leads to the following general result for (35):

$$ (37) \quad \frac{\partial c_j}{\partial \delta} = \left[ \frac{r (N-1)}{N^2} \right] j^{\delta} S t \left\{ \frac{(\psi-1)}{(N/k) \ln(N/k)} - \frac{1}{(k^{\delta+1})} \right\} \sum_k \ln(k) k^{\delta+1} ] / \left[ \sum_k k^{\delta} \right] $$

Clearly the sign of this quantity depends upon the sign of the bracketed term which we shall call $A_j$. For the case when $j=N$, this term equals (where we have repeatedly used the properties of logarithms) the following:

$$ (38) \quad A_N = \left\{ \frac{-(\psi-1)}{(N/k) \ln(N/k)} k^{\delta} + \frac{1}{(k^{\delta+1})} \right\} \sum_k \ln(k) k^{\delta+1} ] / \left[ \sum_k k^{\delta} \right] $$

The first term is negative or zero when $\psi \geq 1$, and it becomes more an more positive as $\psi$ drops below one and gets closer and closer to its lower bound of zero. Hence, we can bound $A_N$ from above by setting $\psi=0$. This produces:

$$ (39) \quad A_N < \left[ \sum_k k^{\delta} \right] \left[ \sum_k \ln(N/k) k^{\delta} \right] - \left[ \sum_k k^{\delta+1} \right] \left[ \sum_k \ln(N/k) k^{\delta+1} \right] $$

$$ = \left[ \sum_k k^{\delta} \right] \left[ \sum_k \ln(N/k) k^{\delta} \right] - \left[ \sum_k k^{\delta} \right] \left[ \sum_k \ln(N) k^{\delta+1} \right] - \left[ \sum_k k^{\delta+1} \right] \left[ \sum_k \ln(k) k^{\delta+1} \right] $$

$$ = \left[ \sum_k k^{\delta} \right] \left[ \sum_k \ln(N/k) k^{\delta} \right] - \left[ \sum_k k^{\delta} \right] \left[ \sum_k \ln(N/k) k^{\delta+1} \right] $$

$$ = \left[ \sum k^{\delta} \right] \left[ \sum k \ln(N/k) k^{\delta} (1-k) \right] < 0. $$
Hence, \( \partial c / \partial \delta \) is always negative for the highest income class, and political contributions decrease for this class if \( \delta \) increases.

Consider the derivatives with respect to \( \psi \) as well. Note that \( \psi \) only works through revenues.

\begin{align*}
\partial c / \partial \psi &= \left( \frac{N-1}{N^2} \right) \sum_k k^\delta \left( \frac{N-1}{N^2} \right) \sum_k k^\delta \frac{\partial r}{\partial \psi} \left( t Y_+ / \partial \psi \right) \\
&= \left( \frac{N-1}{N^2} \right) j^\delta \left( \sum_k k^\delta \right) > 0.
\end{align*}

Thus, when the lowest income level is raised while keeping the income step the same, political contributions will increase—although the effect is entirely through the impact of changing revenues as a result of changing the lowest income.

We could also change the income step while keep \( \psi \) the same. Then we get:

\begin{align*}
\partial c / \partial S &= \left( \frac{N-1}{N^2} \right) j^\delta \left( \sum_k k^\delta \right) \left( t Y_+ / \partial S \right) \\
&= \left( \frac{N-1}{N^2} \right) j^\delta \left( \sum_k k^\delta \right) \left[ (\psi-1) + \left( \sum_k k^\delta + 1 / \sum_k k^\delta \right) \right] > 0.
\end{align*}

Where the inequality is obvious if \( \psi \geq 1 \), but it also holds true if \( \psi < 1 \) because the smallest \( \psi \) is (near) zero in which case the last bracketed term is:

\begin{align*}
(0-1) + \left( \sum_k k^\delta + 1 / \sum_k k^\delta \right) &= \left[ -\sum_k k^\delta + \sum_k k^\delta + 1 / \sum_k k^\delta \right] = \sum_k (k-1) k^\delta > 0.
\end{align*}

Hence, political contributions increase if \( S \) changes while \( \psi \) stays the same. In this case, the value of the lowest income \( Y_1 \) must increase by the same amount as \( S \) and an increase in \( S \) amounts to a proportionate increase in all incomes. It should be no surprise that contributions increase in this case. In fact, they increase proportionately at all income levels.

Table 1 summarizes the results for proportional taxation. Note that there are two columns – one for those values of \( \delta \) below \( \delta_{MAX} \) and another for those of \( \delta \) above \( \delta_{MAX} \). The last four rows show what happens to political contributions with various changes in the income distribution.

The most important result is that when \( \delta \) is below \( \delta_{MAX} \), then the political contributions for the lowest class will increase when income inequality increases, and those of the highest class will decrease. Two other interesting results are in Table 1. As \( \psi \) increases (as the lowest income increases) income inequality decreases but political contributions increase from all groups. As \( S \) increases (as the income step increases) income inequality increases, and political contributions increase from all groups. This leads to the following possibility. By increasing \( \psi \) and decreasing \( S \) in just the right amounts, income inequality can be dramatically reduced. At the same time, increasing \( \psi \) increases political contributions but decreasing \( S \) decreases political contributions.
Conclusions

The model developed in this paper does three basic things. First, it makes predictions that are in accord with the known facts about political contributions. Second, it suggests that care must be taken when thinking about how changes in inequality will affect political contributions. Third, it offers concrete ideas about how we should do our empirical work.

As for the known facts, the model shows that if the size of an income class decreases with income, then contributions increase with income. For the specific case where the discrete Pareto distribution is used to model the income distribution, equation (29) shows that the value of \( \delta \) determines the relationship between contributions and income, and when \( \delta \) is negative (so that the size of income classes decreases with income) this relationship is positive. Second, for distributions with enough right-skew, per-capita contributions increase progressively with income as long \( \delta \) is less than -1.

Second, the model shows that two kinds of changes in income distributions are possible. One kind of change is when income levels remain the same but people move from one level to another. In the discrete Pareto distribution, changes in \( \delta \) have this kind of impact. When \( \delta \) is negative with a value in the region that is empirically observed, then an increased \( \delta \) means increased inequality and an increase in contributions from the lowest class and a decrease from the highest class.

Another kind of change occurs when the incomes attached to classes change. When income increases proportionately for all classes (that is, when the income step \( S \) changes while keeping the ratio of the lowest income to the income step \( \psi \) the same), then political contributions increase, but only because mean income has increased. In this situation, relative inequality remains the same. When the ratio of the lowest income to the income step \( \psi \) increases, then political contributions increase because mean income increases as well. Relative inequality also decreases because the standard deviation of incomes compared to their overall mean decreases.

This discussion suggests that the way inequality changes matters for political contributions. Changes in where people are located in the distribution as indexed by \( \delta \) have different implications for rich and poor classes whereas changes in the incomes attached to locations have the same implications for all income classes.

Finally, these results have significant implications for empirical work. The starting place is to consider equation (29) and equation (31):

\[
(29) \quad \log(c_j) = \log((N-1)/N^2) + \log(\sum k^\delta) + \log(r) - \delta \log(j).
\]

\[
(31) \quad Y_j = \psi S + (j-1)S.
\]

If we let \( a(N,\delta) \) equal the first two terms in (29) (with the arguments to remind us that it is a function of \( N \) and \( \delta \)) and we solve for \( j \) from (31) and substitute it into (29), we get:
(43) \( \log(c_j) = a(N, \delta) + \log(r) - \delta \log[(Y_j - Y_1 + S)/S] \)

We could estimate this equation at a specific time in a specific jurisdiction by defining income classes \( j = 1, \ldots, N \). Given the importance of income classes in the model, the way these are defined is a non-trivial decision and some thought must be given to whether people actually think of income classes in this way.\(^{10}\) For this situation, \( a(N, \delta) \), \( r \), \( \delta \), \( S \), and \( Y_1 \) should be constant while \( c_j \) and \( Y_j \) would vary. Thus, we could simply regress the logarithm of per-capita contributions \( c_j \) for each income class on the logarithm of \( [(Y_j - Y_1 + S)/S] \). We could even have an ancillary regression where we could cross-check the value of \( \delta \) by fitting the logarithm of equation (25) to data on the fraction of people in each income class \( j \):

(44) \( \log(L_j) = -\log[\sum_k k^\delta] + \delta \log[(Y_j - Y_1 + S)/S] \).

If we have data on political contributions and income over time or across jurisdictions or both, then we might expect that \( a(N, \delta) \), \( r \), \( \delta \), \( S \), and \( Y_1 \) would also vary. Data could be collected on \( r \), \( S \), and \( Y_1 \) to estimate (44), and the term \( a(N, \delta) \) could be treated as a fixed effect for each jurisdiction or even each jurisdiction-time-period. The parameter \( \delta \) could be treated as a function of a measure of inequality such as the coefficient of variation as follows:

(45) \( \delta = \lambda + \xi (CV) \)

When substituted into (43) above, this would lead to a term in the logarithm of income and an interaction term between income and inequality. Of course, this approach assumes that any change in inequality is due to change in the locations of people in the income distribution, and not due to changes in the incomes assigned to them. It is not clear how this distinction can be made in practice.

In summary, this paper has developed a model that is consistent with the stylized facts about political contributions and income and that also provides substantial guidance on how empirical work should proceed. Other models, of course, could be developed that might make other predictions, but it seems likely that any other approach will raise similar kinds of issues.

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\(^{10}\) The empirical model, for example, might want to take into account degree of class consciousness and the extent to which politics in a given place and time is affected by class considerations.
Table 1 – Summary of Comparative Statics for Proportional Taxation

<table>
<thead>
<tr>
<th>Value of Distributional Parameter for Income Distribution</th>
<th>$\delta &lt; \delta_{MAX}$</th>
<th>$\delta &gt; \delta_{MAX}$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean Income by Change in</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\partial Y_+ / \partial \delta$ Income Structure</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>$\partial Y_+ / \partial \psi$ Lowest Income</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>$\partial Y_+ / \partial S$ Income Step Size</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td><strong>Coefficient of Variation (Inequality) by Change in</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\partial CV / \partial \delta$ Income Structure</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>$\partial CV / \partial \psi$ Lowest Income</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>$\partial Y_+ / \partial S$ Income Step Size</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Political Contributions By Change in</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\partial c_1 / \partial \delta$ (Lowest Class) Income Structure</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>$$\uparrow$$ with $\uparrow$ Inequality and with $\leftrightarrow$ or $\uparrow$ for Mean Income</td>
<td>$$\uparrow$$ with $\downarrow$ Inequality and with $\leftrightarrow$ or $\uparrow$ for Mean Income</td>
<td></td>
</tr>
<tr>
<td>$\partial c_\psi / \partial \delta$ (Highest Class) Income Structure</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>$$\downarrow$$ with $\uparrow$ Inequality and with $\leftrightarrow$ or $\uparrow$ for Mean Income</td>
<td>$$\downarrow$$ with $\downarrow$ Inequality and with $\leftrightarrow$ or $\uparrow$ for Mean Income</td>
<td></td>
</tr>
<tr>
<td>$\partial c / \partial \psi$ (All Classes) Lowest Income</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>$$\uparrow$$ with $\downarrow$ Inequality and with $\uparrow$ for Mean Income</td>
<td>$$\uparrow$$ with $\downarrow$ Inequality and with $\uparrow$ for Mean Income</td>
<td></td>
</tr>
<tr>
<td>$\partial c / \partial S$ (All Classes) Income Step Size</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>$$\uparrow$$ with $\leftrightarrow$ Inequality and with $\uparrow$ for Mean Income</td>
<td>$$\uparrow$$ with $\leftrightarrow$ Inequality and with $\uparrow$ for Mean Income</td>
<td></td>
</tr>
</tbody>
</table>

Key: + means derivative has positive sign; - means derivative has negative sign; 0 means derivative is zero; $$\uparrow$$ means Contributions; $\uparrow$ means Increase; $\leftrightarrow$ means stays the same; $\downarrow$ means Decrease;
Figure 1: Percentage of Family Income to Campaigns, Charity and Church by Family Income

Family Income

% of Income Contributed

< 15K 15-35K 35-50K 50-75K 75-125K 125K >

CAMPAIGN
CHARITY
CHURCH
Figure 2 – Examples of Income Density Distributions for Various Values of $\delta = -3, -2, -1, 0, +1, +2, +3$ along the horizontal axis and for N=10 (above) and N=5 (below).
Figure 3–Value of Coefficient of Variation by values of $\delta$ on horizontal axis and by Various Values of N (2,3,4,5,20)
Fig. 4: Value of Delta at Which Coefficient of Variation is Largest by Number of Classes and Ratio of Lowest Income to Income Step

Ratio of Lowest Income to Income Step (Psi)
Figure 5A: Right Skewed Income Distribution

delta = -2 and psi = 1

Figure 5B: Per Capita Contributions by Class

as Fraction of Revenues (cj/r)
References


