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'Voting for inflation': The political economy of inflation and inequality

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MAIN POINTS

Inflation operates as a tax, and the poor often find it hardest to avoid. This model and supporting empirical evidence show that higher inflation in developing countries results from greater income inequality, since the implied imbalance of political power leads governments to favour this regressive alternative tax.

ABOUT THE AUTHOR

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Executive Summary

Tax systems vary widely across countries. In addition to taxes governed by statute, some governments have also relied on less obvious forms of taxation, including the tax raised by printing money – referred to as seigniorage or the inflation tax.

Of course all governments claim to want low inflation, but not all achieve it. While poorer countries generally fare worse, inflation rates can differ markedly even between equally wealthy countries. One consistent relationship is that the distribution of income, and not just its average level, is correlated with inflation. In particular, greater income inequality and higher inflation appear to be linked.

One explanation for this relationship is that the distributional impact of the inflation tax is likely to differ considerably from that of alternative tax instruments. In particular, several studies have pointed to its essentially regressive character, since it is typically the less well-off who find it hardest to avoid.

This paper argues that this distributional aspect of inflation interacts with political bias against those most affected by the inflation tax (poor and middle class groups) to explain the relationship between inequality and inflation. Essentially, greater income inequality increases the relative political weight of the wealthy (because it increases their income relative to the average level), and therefore leads policy-makers to pursue tax policies more beneficial to their interests. This entails greater reliance on the inflation tax and less reliance on more progressive tax instruments.

The paper presents some empirical results broadly supportive of this prediction. The results suggest that countries seeking permanently lower inflation should seek to insulate the money creation process from political forces. Making political representation more equal should have a similar effect. Finally, it suggests that the popular view of an inherent conflict between stabilization policy and pro-poor redistributive aims may be missing an important mechanism by which the two goals can be mutually-supporting – namely, the pro-poor effect of lower inflation.

Introduction

As shown in related papers in this study, tax systems vary widely across countries, in terms of the range and coverage of tax instruments employed, the progressivity or regressivity of the system, and the efficiency of tax collection. In addition to taxes governed by statute, some governments have also relied on less obvious forms of taxation, including the tax raised by printing money – referred to as seigniorage or the inflation tax. The distributional impact of the inflation tax is likely to differ considerably from that of alternative tax instruments. In particular, several studies have pointed to its essentially regressive character, since it is typically the less well-off who find it hardest to avoid.

Of course all governments claim to want low inflation, but not all achieve it. While poorer countries generally fare worse, inflation rates can differ markedly even between equally wealthy countries. Turkey and Korea had similar levels of income per capita at the start of the 1980s. However, while Turkey's inflation averaged 60% per year over the next two decades, Korea's averaged 6%.

One explanation is that policy-makers in countries like Turkey were simply unlucky or incompetent. But evidence on the relationship between inflation and income inequality suggests an alternative explanation.

Figure 1 below illustrates the relationship for 53 countries between 1981 and 2000. The vertical axis plots the average 'inflation tax rate' (a transformation of the inflation rate which prevents extremely high values dominating the data). The horizontal axis plots the most widespread measure of income inequality, the 'Gini coefficient.' More inequality is associated with higher inflation.

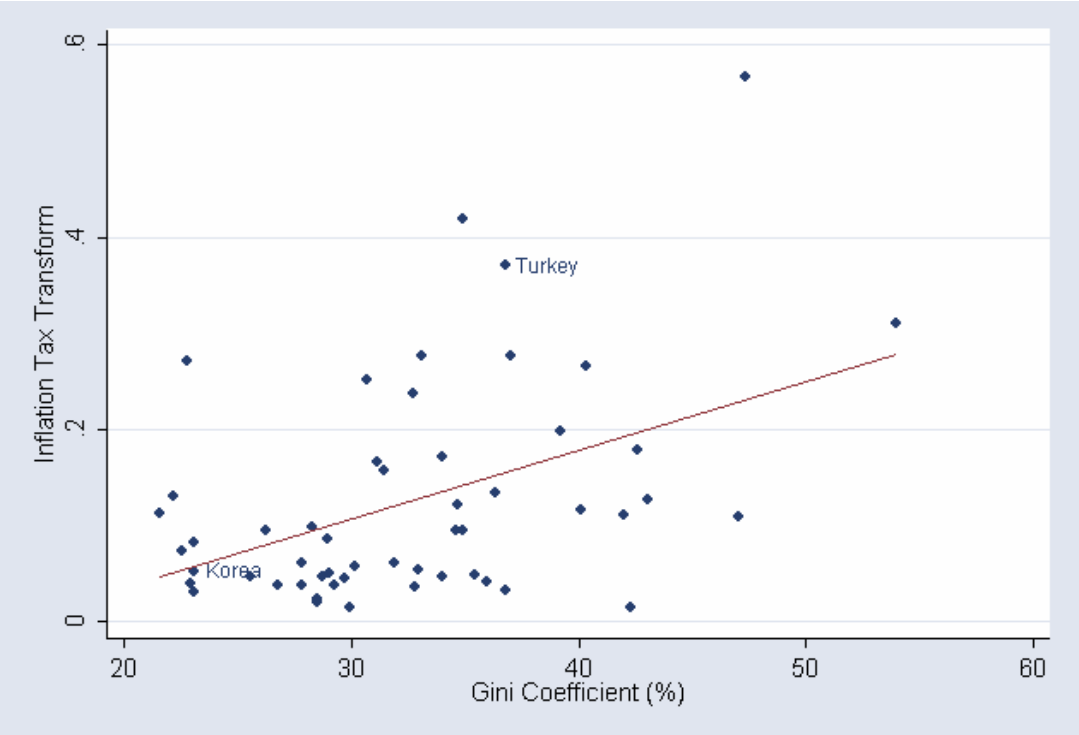
This paper contributes to an emerging literature investigating how political factors can drive economic policy. It argues that the distributional aspect of the inflation tax compared to other tax instruments is key to explaining how political and social factors can impact on the inflation tax rate chosen by policy-makers. It offers a model that can rationalise the robust positive relationship between income inequality and inflation noted in other studies (Bhattacharya et al. (2003); Albanesi (2002); Dolmas et al. (2000); Bulif (1998); Easterly and Fischer (1998); Beetsma and Van Der Ploeg (1996)).[1]

The model is motivated by a simple public finance problem: the financing of a public good via a linear income tax and/or seigniorage. Financial market imperfections mean that richer agents find the inflation tax easier to avoid, making it a regressive form of taxation.[2]

[1] Bhattacharya et al. (2003) actually identify an inverse-U shaped relationship, positive for all but extremely high values of inequality. Easterly and Fischer (1998) focus on the income share of the lowest 20% of the income distribution, rather than an inequality measure based on the entire distribution (such as the Gini coefficient). Note as well that some studies assume a causal relationship, and differ in the direction of causation, whereas others merely note the correlation.

[2] That seigniorage tends to be a regressive form of taxation, its incidence felt particularly harshly by poorer agents and the middle classes, is well documented (Easterly and Fischer (2001), Erosa and Ventura (2002), Kane and Morisett (1993)).

Figure 1: Inflation and inequality



The elite bias in the political system gives rise to what is essentially a weighted welfare maximisation problem, where agents' weight is increasing in income. The choice of income tax versus seigniorage and the level of government spending is then determined by the interaction of three competing motivations. The first is the standard public finance problem: to provide the efficient level of the public good via the optimal choice of taxation. The second motivation is an equity one: to provide a degree of consumption equalisation. This results from the concavity of agents' utility functions, and biases the policy-maker towards using income taxation, the more progressive form of taxation, to finance government expenditure. However, there is a third, political bias effect, that causes the policy-maker to favour policies more beneficial to richer groups in society. This can lead to positive seigniorage in equilibrium as the burden of taxation is shifted onto the less well-off.

The pro-rich bias can be accentuated by increased income inequality, since greater income dispersion magnifies the disparity in political power. The model then predicts that societies with more income inequality and where the pro-rich political bias is stronger will tend to suffer from higher inflation.

Although the model is in the tradition of a growing theoretical literature, its precepts may seem unconventional, particularly in light of earlier formal and informal explanations of inflation. The idea that inflation can emerge as a deliberate policy choice, rather than as a result of policy failure, fiscal mismanagement, adverse shocks or time inconsistency, requires some motivation. Similarly, the idea that inflationary policies might be related to 'pro-elite' political bias may also appear controversial, not least because in earlier models that approach the issue, it tends to be 'populists' – politicians of the 'left' – that are assumed to be more inflation-

tolerant. This may arise either from a greater desire to offset output fluctuations, or from the need to finance higher public expenditure.[3]

The view that left-wing parties may be more averse to output fluctuations is certainly defendable. However, if the resulting inflationary bias is greater for the 'left-wing' party and hence more electorally damaging, this party might have the most to gain from a tougher anti-inflationary stance.[4]

Distributional considerations reinforce this argument. The available evidence suggests that inflation is most harmful for those at the bottom and middle of the income distribution – the natural constituency of parties of the 'left'. Distributional effects become particularly salient when the issue is placed in a context of fiscal dominance of monetary policy, as in this paper. If money creation is fiscally motivated, its incidence and distributional dimension relative to alternative tax instruments becomes the critical question. An expenditure explanation – that inflation emerges as a result of increased government spending and the monetisation of the resultant fiscal deficit – requires that more progressive tax instruments are unavailable. Otherwise, why would a rational 'left-wing' government adopt a tax instrument that falls heaviest on its favoured constituency?

Because the model makes a number of quite strong assumptions which are central to its results, it is vulnerable to accusations that these results simply follow directly from the assumptions, with the model contributing few additional insights. However, I believe that the model delivers insights that are greater than the sum of its assumptions. Firstly, the key relationship is a subtle one: the conditioning effect of political bias on the inequality-inflation relationship. The model illustrates quite precisely the conditions under which the existence of pro-rich bias gives rise to the positive relationship between inflation and inequality. Essentially, political influence must increase with income with a greater than unit elasticity, so that the distribution of political bias is more unequal than that of income and becomes progressively more unequal, in relation to income, as income inequality increases. Secondly, the political bias effect is only one effect, balanced by a competing motivation to equalise income generated by agents' concave utility. The model's contribution is its illustration of how these effects interact. Finally, both the assumption that political bias increases sharply with income and the assumption that inflation is regressive seem important for any political economy model relating to fiscal and monetary policy. Both relationships have received robust empirical support, as detailed below. Their implications for policy, analysed in this paper, also receive empirical backing.

The rest of the paper is organised as follows. Section I outlines the model of the economy. Section II provides an empirical analysis of the relationships outlined in the theoretical portion of the paper. The empirical results are broadly supportive of the paper's theoretical arguments, although there are some interesting results that merit further research. Section III concludes.

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[3] For instance, the canonical Partisan Cycle model has two parties (Left (L) and Right (R)) competing for control over monetary policy, and assumes that the parties differ in the relative weight attached to inflation in their social loss functions. Party L places less weight on inflation and more weight on output fluctuations, resulting in a greater inflation bias (Persson and Tabellini (2000), pp 426-31).

[4] And party R (using the Partisan Cycle model's terminology) might gain by increasing the inflationary bias, thus increasing the cost of electing party L and boosting its own reelection chances. See Milesi-Ferretti (1994).

I. The model

Household behaviour

The model employs a simplified overlapping generations framework, similar in spirit to that in Bhattacharya et al. (2003) but greatly simplified to allow for analytical solutions and to facilitate a fuller treatment of the income distribution and the political environment. The model is discussed in more depth in Crowe (2004). I present only its key features here.

Each household lives for two periods, with one cohort born each period. In the first period the household receives an endowment of the single consumption good. Agents are heterogeneous in their endowment. Consumption takes place in the second period, but the good is assumed to be perishable and is destroyed after one period. Hence some transactions technology is necessary to allow the 'young' to transfer their endowment to the 'old' in exchange for purchasing power the following period. There are two assets in the economy to facilitate this exchange: cash (whose supply is controlled by the government) and a second asset in fixed supply. This second asset can be thought of as a real asset, a foreign currency or an indexed asset. Essentially it is an inflation shelter.

Households face a (real) fixed cost of operating in the market for the second asset, denoted λ. The empirical and theoretical work on portfolio choice has posited the existence of fixed costs of participation in markets for non-cash financial assets. Luttmer (1999) analyses US data on asset holdings and argues that the lower bound on the cost is 3% of monthly per capita consumption. Mulligan and Sala-i-Martin (1996) also argue for the existence of a fixed cost of financial market participation, although they argue that the fixed cost varies across agents due to individual-specific characteristics, including age, education and financial wealth. Erosa and Ventura (2002) analyse US data, showing that poorer agents are more reliant on cash holdings as a proportion of their aggregate wealth, suggestive of a fixed cost to asset portfolio diversification.

Agents are subject to two taxes: a linear income tax τ and the inflation tax, which is paid only by cash-holders. Denoting the inflation tax rate $\pi^T=(\pi/(1+\pi))$ and a policy indicator $\gamma=((1-\tau)/(1-\tau-\pi^T))$, the fixed cost of participation implies that agents with income below a critical level y^* hold cash and agents with income above this level hold the inflation shelter, where the critical level is defined as:

$$y^* \equiv ((\gamma\lambda)/(\gamma-1))$$

In addition to consuming the private good, agents also consume a public good g which is funded out of taxation and seigniorage revenue.

Policy-maker's behaviour

I adopt the probabilistic voting model originally due to Lindbeck and Weibull (1987). I adopt the formulation of Persson and Tabellini (2000). Policy-makers are elected for one period, and choose a level of government expenditure **g**, a single income tax rate **τ**, and an expansion in the money supply. The latter is equivalent to choosing a rate of inflation or more conveniently a rate of the inflation tax (seigniorage) π^T. Policy-makers derive utility only from being elected. There are two policy-makers seeking election, and the electoral rule is simple majority voting. For simplicity, it is assumed that policy positions are announced and the election occurs after agents have made their asset-holding choices. That is, only the 'old' vote, with the vote taking place at the start of their second period of life.

I make a critical assumption that agents differ in their political 'weight,' where this weight is generally assumed to be increasing in agents' income. This reduced-form formulation is designed to account for the observed greater political participation by richer agents (see Benabou, 2000 and 2003 for similar models and comprehensive evidence of the influence of income on political activity and influence).[5] It can be rationalised by introducing lobbying (see Persson and Tabellini, 2000) or by simply making richer agents more likely to vote, or by making the variance of the noise in agents' voting rules vary inversely with income. Later I assume a specific functional form for the relationship between agents' income and their political weight. For the time being I allow for a general specification.

Assuming that both financing instruments are used in equilibrium (i.e. an interior solution) we arrive at the following implicit solution for **γ**:

$$\gamma = \frac{W^{NC}}{W^{C}} \frac{m}{(1-m-(1-F)\lambda)}$$

$$\gamma = \frac{y^*}{y^* - \lambda}$$

Where W^{NC} and W^{C} are the total political weight of non-cash and cash-holders respectively, **m** is the real value of the money stock (where the economy is normalized to one) and **F** is the share of non-cash-holders in the population as a whole (where the population is also normalized to one).[6]

The concavity of the utility function makes the policy-maker disinclined to use seigniorage, since it worsens inequality. However, the political economy environment makes the policy-maker more inclined to use seigniorage, since it transfers resources to his more favoured constituency, richer agents. Hence, the optimal mix of tax and seigniorage is that which balances these two effects. When seigniorage is low relative to total government expenditure, the authorities can increase its use,

[5] Benabou (2003) quotes a startling study of political responsiveness of US senators, which finds that senators' responsiveness to the views of their constituents (as deduced from survey data) is between 3 and 15 times higher for voters in the 75th percentile than for those in the 25th percentile. The responsiveness to views of voters in the 99th percentile is 2-3 times higher still. And this is in a mature representative democracy. As he points out, in poorer countries 'there is also extensive vote-buying, clientism, intimidation and the like, which are likely to result in even more bias.'

[6] The first equation is derived from the first order conditions of the policy-maker's problem, with respect to the two tax instruments. The second equation restates the condition defining the 'critical' agent who is indifferent between holding cash and the second asset.

transferring more resources to richer agents. However, as seigniorage increases and the consumption of better-off agents rises and that of poorer agents falls, the marginal utilities of the less well-off become weighted more heavily in the policy-maker's objective function. Hence, the political bias effect becomes less important relative to the redistribution effect. Eventually, the two effects counter-balance each other, giving the optimal mix of tax and seigniorage.

In order to illustrate this logic, I need to specify a specific functional form for the weighting function. I assume that agents' political weights derive from their grouping together in factions in order to lobby policymakers. Agents with the same preferences over policy are assumed to belong to the same faction and share the same weight. The weight for each agent in a specific faction can then be thought of as the faction's average lobbying strength. I assume that this weight is a positive function of the average income (after payment of the financial market participation cost λ) of agents in each faction. Specifically, if the average income of agents in faction j is given as y^j, then the weight of agents in this faction is given as:

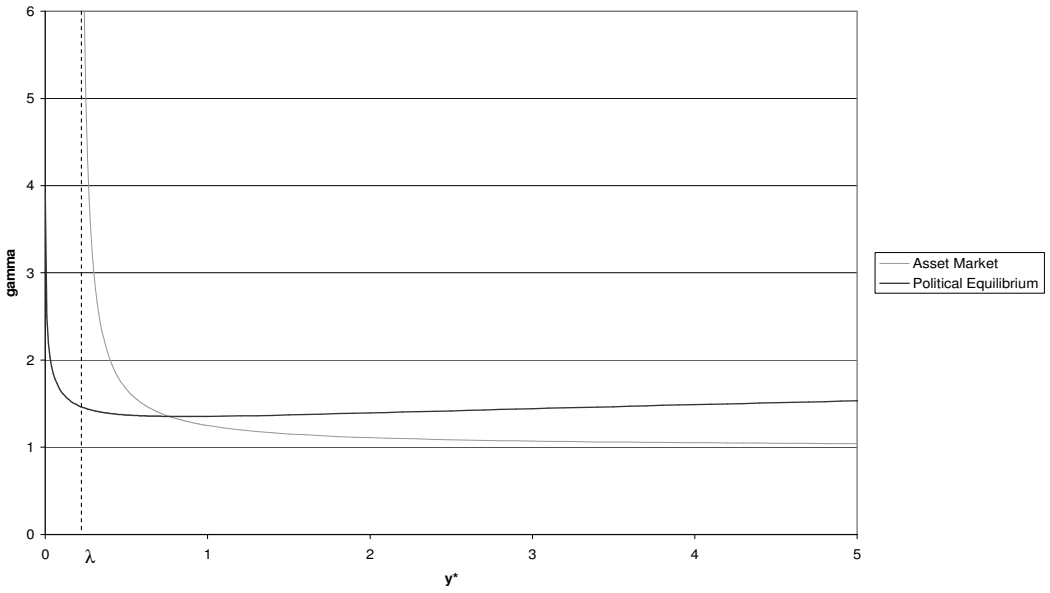
$$\mathbf{w^j = (y^j)^\theta;\ \theta \geq 0}$$

Agents' preferences over policy are determined solely by their status as cash-holders or non-cash-holders: hence, this defines the two factions **j=C,NC**. This implies that the political economy solution is given by the following two equations – where the first gives the political economy equilibrium for a given distribution of cash-holders and non-cash-holders and the second gives the asset market condition that defines who holds cash:

$$\gamma = \left(\frac{y^{NC} - \lambda}{y^{C}} \right)^{\theta - 1} = \frac{y^{*}}{y^{*} - \lambda}$$

For the rest of the paper I assume that there is a unique solution for **γ**. Figure 2 illustrates the two relationships (plotted for a log-normal income distribution).

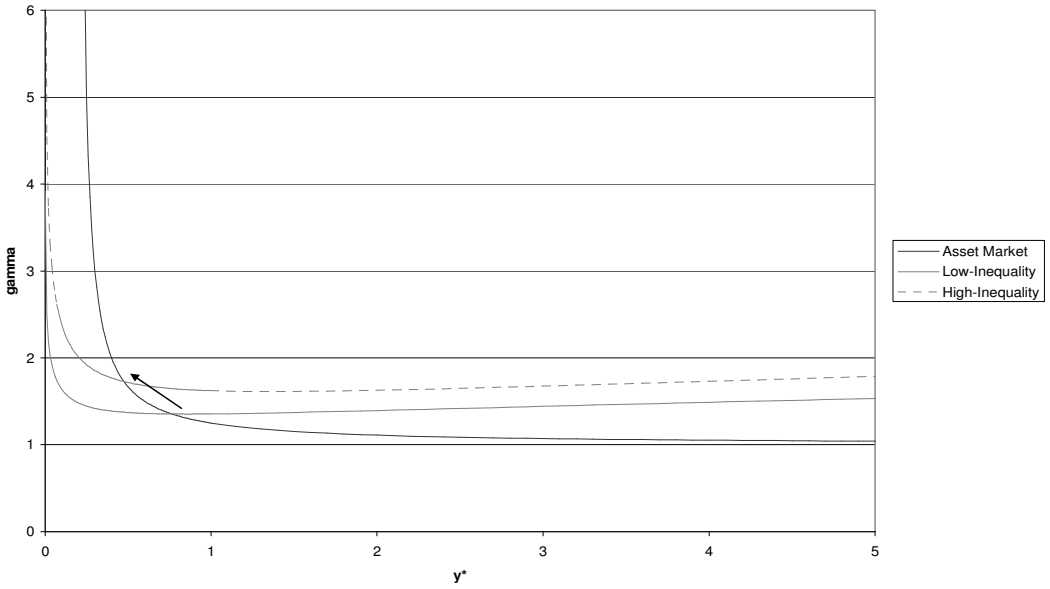
Figure 2: Asset market and political equilibrium



Comparative statics

The key comparative statics result is the link between inequality and the policy parameter **γ**. It can be shown that **γ** increases with inequality if the political bias is sufficiently strong (**θ>1**). This is because, with the policy-maker biased towards richer agents, greater income inequality translates into more political clout for the better-off and hence policy more favourable to their interests. Without restrictions on the function **F**, shifts in the distribution from a distribution **F** to a second distribution that is Lorenz-dominated by **F** are *generally* associated with an increase in **γ**. It can be shown that this relationship holds for certain given certain unrestrictive conditions.[7] The effect is illustrated in Figure 3, again plotted for a log-normal income distribution.

Figure 3: Increasing inequality leads to higher seigniorage in equilibrium



Hence: Result 1(a): Inflation increases with income inequality
Result 2(a): Income tax decreases with income inequality

Similarly, increasing the political bias (by increasing **θ**) also shifts the optimum policy upwards (for a given $\mathbf{y}^*$). Hence:

Result 1(b): Inflation increases with the pro-rich bias
Result 2(b): Income tax decreases with the pro-rich bias

Changing inequality and pro-rich bias have no effect on government spending (as a proportion of total spending in the economy) in this model. This is a result of the log-linear additively separable utility specification and the fact that all spending is in the form of a public good. Essentially, distributional considerations matter for the composition of taxation and its incidence but not for aggregate revenue or expenditure.

Result 3: Government final expenditure (as a share of total output) is unrelated to both (a) inequality; and (b) pro-rich bias.[8]

[7] These conditions hold in the case of a specific and widely-used distribution, namely the lognormal.
[8] Note that this result is due to the assumption of additive separability in the utility function with respect to private good and public good consumption. This is a simplifying assumption of the model

II. Empirical analysis

This empirical section tests the central results derived in the theoretical portion of the paper:

1.Higher seigniorage results from:
    a.greater income inequality; and
    b.greater pro-rich bias in policy-making;

2.Higher income tax revenue results from:
    a.less income inequality; and
    b.less pro-rich bias in policy-making;

3.Government final expenditure (excluding transfers) is unrelated to both:
    a.income inequality; and
    b.pro-rich bias.

The results are strongly supportive of propositions 1(a) and 1(b). Result 3 (a) is strongly supported, and there is reasonably strong support for Result 3 (b). There is some evidence supporting Results 2(a) and 2(b), although the evidence is not robust to specification or sample. The first section describes the methodology employed and the data used. The second section discusses the results of the empirical analysis, and the third section offers a brief discussion.

Methodology and data

This paper analyses inflation as the result of a political conflict over financing public expenditure. The key linkages are between the government budget constraint and seigniorage, and between money creation and inflation. Both linkages should be conceived as long term phenomena. In the short run, the gap between expenditure and tax revenue can be made up by borrowing; recourse to seigniorage is not necessary until the costs of borrowing outweigh the benefits, which may not occur until a substantial degree of borrowing has occurred. Similarly, although Friedman's assertion concerning inflation's monetary genesis is not to be doubted, the short run relationship between the money supply and inflation is notoriously difficult to pin down (except during hyperinflationary periods).

Hence, I have taken the long run as the appropriate time frame for analysis. This precludes the use of a panel approach to the problem, and I therefore adopt a simple cross-section framework. Data availability makes the 1981-2000 period the most fruitful for analysis.

I obtain data from a range of sources. Inequality data is obtained from the UNU/WIDER World Income Inequality Database (WIID) in the form of Gini coefficients. The quality of the observations and the survey method is coded in the data: I use only the highest quality data where the sample used is representative of the country's full population, and adjust observations to take into account the survey method (gross versus net and income versus expenditure).

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and is not central to the analysis; in this sense result 3 is not central to the paper. However, if the inequality and bias terms are found to affect tax and seigniorage choices then the test of result 3 is essentially a check that the model's emphasis on the revenue side rather than the expenditure side is correct.

The data is presented in annual format, although with a substantial number of missing observations for most countries. In order to maximise the number of observations, data are averaged over the period (i.e. data may be unavailable for the first year of the period, but available for subsequent years). To control for the endogeneity of income inequality I use a measure of inequality from the previous twenty-year period (similarly calculated) as an instrument and undertake Two-Stage Least Squares (2SLS).

There are several widely-used datasets of political institutions available to the researcher, which focus on both specific areas of difference (presidential vs parliamentary, 'left' vs 'right') as well as general indicators ('democracy' vs 'autocracy'). I attempt to exploit the wide range of information by using as my measure of 'pro rich bias,' $\boldsymbol{\theta}$, a variable derived from as wide a range of sources as possible. Hence, I use factor analysis (principal factor method) to generate a single indicator from five separate variables taken from four datasets. Each component represents a measure of political participation or competition.[9] This is based on the assumption that when political participation is limited, the poor are the first to be shut out from the political process.

The model suggests that the political bias term plays a role when it is high ($\boldsymbol{\theta>1}$). If the political bias is below this threshold (so that agents' political influence is increasing in income, but with less than unit elasticity), then there is no effect. Hence, I allow for different slopes for high and low values for the derived measure. I also allow for differential effects of inequality depending on whether the bias term is high or low, for the same reason.

I find that two other variables from the various datasets can be significant as controls. These are a 'Left-wing executive' indicator from the World Bank *Database of Political Institutions* and a measure of regime instability derived from a measure of 'Durability' taken from the *Polity IV* dataset.

The dependent variables are the average of the 'inflation tax' transform ($\boldsymbol{\pi^T}$) over the period (the average of the annual rates, taken from the IMF's *International Financial Statistics*) and the average ratios of income tax revenue and government final consumption spending to GDP (both taken from the World Bank's *World Development Indicators*). I also include a number of other control variables, including dummies for industrial countries, former Eastern Block countries and South American countries, measures of trade openness and real (PPP) GDP per capita taken from the *Penn World Tables* (PWT 6.1), and a measure of urbanisation (% of the population living in urban areas, taken from the World Bank *World Development Indicators*). These controls are taken for the first year of the period to denote initial conditions.

Because the sample size is relatively small, I have attempted to conserve degrees of freedom by limiting the controls in the preferred specifications. In these regressions, controls have been chosen optimally according to two rules:

[9] The five variables are 'Index of Electoral Competitiveness (executive elections)' from the World Bank's Database of Political Institutions (DPI); 'Political Participation' and 'Freedom of Association' from the Cingranelli-Richards (CIRI) Human Rights Database; 'Competitiveness of Political Participation' from the Polity IV (P4) database, and the 'Political Freedom' indicator from Freedom House. Each component variable is averaged over the period before being combined using factor analysis. Correlation between the five variables for the 53-country sample varies from 66% to 92%.

1.All controls should be individually statistically significant at the 10% level or above;
2.Within the class of specifications meeting requirement 1, the preferred specification is that which minimises the Root Mean Squared Error (RMSE).

Once the set of controls has been arrived at, I test for the equality of slope and intercept coefficients for the **θ** high and **θ** low groups. When the hypothesis that coefficients are equal cannot be rejected (at the 10% level) I present results with equality imposed, to increase the model's degrees of freedom and improve the efficiency of the parameter estimates. I also present regression results with the full range of controls for robustness purposes (again, I test for equality of coefficients and impose it when the evidence is supportive).

Results

The Results are presented in Tables 1-3. In each Table, the first three columns show results from the preferred specification. The last three regressions include the full range of control variables. Within each group of three regressions, the first is for the largest available sample; the second has only Developing and Transition economies, whilst the third regression drops only former Communist countries in Eastern Europe.

The results in Table 1 are strongly supportive of Result 1(a). The coefficient on the gini coefficient is positive, as predicted, and statistically significant in all six specifications. There is some evidence that the slope may be lower for observations with high values for the bias term, which contradicts the hypothesis; however, the difference between the slopes is only statistically significant for the developing/transition economies subsample.

The results are also supportive of Result 1(b): in each specification the coefficient on **θ** for high values of **θ** has the predicted positive sign, and is also statistically significant. The caveat to this result is that in one specification the intercept is higher for countries with low values of **θ**, implying a non-monotonic relationship.

Table 2 presents the results with respect to Results 2(a)-(b). Here the results are not particularly strong. The predicted negative relationship between the Gini coefficient and income tax revenues is confirmed by only two specifications, and in neither case is the result robust to including the full range of controls. The negative relationship between the bias term and income tax is similarly confirmed by only two specifications (in one case the relationship is non-linear), and again is not robust to the choice of controls in either case. Only in one specification and sample (column one) are both coefficients significantly negative. The evidence generally points to there being no difference in the relationships between high-bias and low-bias observations.

Finally, Table 3 presents tests of Results 3(a)-(b). For Result 3(a) all specifications confirm that inequality has no effect on expenditure, as predicted. However, with respect to Result 3(b), the political bias term does affect expenditure in the preferred specification, with a non-monotonic (U-shaped) relationship. The significance of the relationship is not robust when the full range of controls is introduced or a different sample is used (although the positive effect from high values of bias is maintained in one other regression).

Discussion

The results uncovered in Tables 1-3 are quantitatively as well as qualitatively significant. According to the preferred specification and sample (first column of results, corresponding to parsimonious controls and the full sample), the inequality measure has a quantitatively significant positive effect on inflation. The range of the inequality parameter (gini coefficient) in the 53-country sample is 22% to 54%. Given the coefficient estimate of .0089, the estimated effect of increasing inequality from the lowest inequality observation to the highest would be to add an additional 0.29 to the inflation tax transform. If inflation were initially at zero, this would translate into an increase in the inflation rate to around 41%. Similarly, increasing the political bias term θ from 0 to its maximum value (1.43) shifts the inflation rate from zero to 21%. Reducing the political bias term from 0 to its minimum value (-1.20) also raises the inflation rate, to 13%, due to the intercept term. However, this intercept term is not statistically significant in most specifications.

Using the same specification and sample (minus one country due to data availability constraints), shifting from the lowest to the highest gini coefficient reduces income tax revenues (as a % of GDP) by six percentage points. The negative relationship between the bias term and income tax revenues appears to be monotonic. Moving from the lowest value for θ (-1.20) to the highest value (1.43) reduces income tax revenues (as a % of GDP) by five percentage points. These effects are statistically significant in the preferred specification and sample; however, the significance level is not maintained across different specifications and samples.

Finally, inequality appears to have no effect on government consumption (as a % of GDP), as predicted by the theory. However, there does appear to be a U-shaped relationship between the bias proxy and government consumption. In the preferred specification and sample, moving from a mid-value for the bias variable to either of its extreme values is estimated to increase the government consumption/ GDP ratio by around six-seven percentage points. This effect is unique to this sample and specification (although in one other regression the positive effect for higher values of the bias term is maintained). Other results suggest no relationship, in line with the model's predictions.

The apparent non-monotonicity in the relationship between political bias and the inflation tax transform (uncovered in column 1 of Table 1) requires further analysis. It appears that inflation is higher for low levels of bias, then drops at mid-values before increasing for higher levels of bias. One explanation could be that at low levels of bias the core conflict is not between cash-holders and non cash-holders, but between poorer recipients of government programmes (who are insulated, to an extent, from all forms of taxation) and middle class tax-payers who are more concerned with the level of taxation than the choice of tax instrument. Hence, increasing the level of bias might primarily increase middle-class representation, reducing the level of government spending and the share of income taken in both income tax and seigniorage. This could explain the downwards-sloping relationship between government consumption expenditure and the bias term for low levels of bias uncovered in Table 3, columns 1 and 3, and why income tax revenues fall as the bias term increases for low levels of bias in particular (Table 2, columns 1 and 3). A more complex model of the political process and public finance environment, incorporating targeted fiscal transfers or local public goods, could capture these relationships.

The positive inequality-inflation relationship has been identified by other researchers. Romer and Romer (1998) use a cross-sectional framework to analyse the effect of macroeconomic policies on the distribution of income. They find that macroeconomic stability and low inflation are associated with improved well-being of the poor over the long-run. Bulif (1998) also uses a cross-sectional approach, regressing gini coefficients on a number of explanatory variables, including a quadratic expression in income (to test the Kuznets hypothesis) and dummies for hyperinflation, high inflation, low moderate inflation and very low inflation. He finds that higher inflation is associated with more inequality, although the result seems to exhibit a degree of non-monotonicity. In particular, hyperinflationary countries have higher inequality than other countries but at lower levels of inflation the relationship is not so clear-cut. Earlier work by the same author (Bulif and Gulde, 1995) based on a panel of developing and industrial countries also uncovered a positive relationship between inflation and inequality. Easterly and Fischer (1998) use cross-country data and find that higher inflation is associated with the lower 20% of the income distribution having a smaller share of total income, lower minimum wage rates in relative terms, and higher rates of poverty. An IMF (1996) survey of global inflationary trends found that 'high average inflation and high variability of inflation increase income inequality significantly.'

Other authors analyse the link between inflation and poverty. Datt and Ravallion (2002) analyse panel data from Indian states and find that regional differences in the inflation rate contribute positively to poverty. Conversely, Epaulard (2003) studies a cross-section of almost 100 growth and downturn episodes in developing countries and finds that very high inflation increases the responsiveness of poverty to economic slowdowns, but inflation has no direct effect on poverty.

Albanesi (2002) presents evidence of a cross-country correlation between inflation and inequality in support of the positive relationship predicted by her theoretical work. Dolmas et al. (2000) and Beetsma and Van Der Ploeg (1996) present empirical evidence of a positive relationship between inflation and inequality, which they take to support their model linking inflation to populism. Dolmas et al. (2000) controls for measures of central bank independence. However, in neither case does the data allow an explicit test of the political channel hypothesised.

The evidence uncovered above, covering a wider range of countries, suggests that inflation is highest in autocracies, which contradicts Dolmas et al's hypothesis linking inflation to populism. Furthermore, the balance of evidence in the literature, as discussed above, suggests that inflation is regressive (certainly compared to alternative means of finance). This undermines the validity of modelling the inflation tax as progressive. It also makes these papers' results vulnerable to the addition of alternative tax instruments, such as a linear income tax. Bhattacharya et al.'s (2003) prediction of an inverse-U shaped relationship between inequality and seigniorage is supported by the empirical evidence presented in their paper.

III. Policy recommendations and conclusions

Many economic questions are also political questions; and few issues are more political than the appropriate means of funding government expenditure. Although not always immediately recognised as such, siegniorage revenue is raised by taxing those who hold cash. Hence, the choice of inflation rate is also a choice of tax rate, and therefore a political decision. It follows that, just as for other political decisions, a country's rate of inflation might well be influenced by the social and political pressures the country faces.

This paper presents a model to account for a stylised fact noted in a number of studies: that more unequal societies tend to face higher inflation. The model uses a simplified overlapping generations framework to capture the essential features of a cash economy with politically-motivated monetary expansions. Consumption is subject to a one-period delay. Agents have a choice of two financial assets to allow for trade with their neighbouring cohorts: cash (subject to the inflation tax) and a second asset which can be thought of as an indexed asset, a real asset or a foreign currency asset. The ability to substitute from cash to the second asset is assumed to be correlated with income.

This then generates the feature that seigniorage is a more regressive form of taxation than income tax, matching arguments made elsewhere in the literature. Introducing an electorally-motivated policy-maker and a political environment subject to a pro-elite bias, the model predicts that higher inequality and greater bias both lead to greater recourse to seigniorage compared to income tax in equilibrium. The result with respect to the political bias is obvious, the result with respect to inequality perhaps less so. Note that positive seigniorage is the result of the political process alone: pure welfare-maximisation implies zero seigniorage (as shown by setting the political weight of each agent to a constant, capturing the Ramsey problem).

The model's predictions are brought to the data and are broadly supported for the limited (53 country) cross-section dictated by data availability constraints. Overall, the model's predictions with respect to inflation (R1(a) and R1(b)) receive robust support. The hypothesised negative effect of both inequality and political bias on income tax revenues (R2(a) and R3(b)) is supported in the preferred specification, but the results are not robust to the addition of other controls or across all samples. The prediction of no relationship between inequality or political bias and government consumption (R3(a) and R3(b)) is supported, although there is some limited and non-robust evidence suggesting a U-shaped relationship between the bias term and government consumption.

The model and empirical results suggest that the political environment can be an important determinant of macroeconomic policy outcomes. Furthermore, the nature of the income distribution is likely to interact with the political environment. In particular, when agents' relative political voice is determined by income, then income inequality will translate into political inequality and hence onto policy outcomes. This illustrates how political reform – notably increasing the equality of participation between rich and poor groups – might lead to improved policy outcomes.

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Table 1: 2SLS Regressions with Inflation Tax Transform (1981-2000 average) as DV

	Preferred Specification			Full Controls		
	Full Sample	Dev/Trans Economies	Excluding E. Europe	Full Sample	Dev/Trans Economies [10]	Excluding E. Europe
Gini (G)	**.00891*** **		**.00921*** **	**.00862*** **		**.00885*** **
	(.00251)		**(.00254)**	**(.00252)**		**(.00254)**
G×d		**.00182**			**.00336**	
		(.00300)			**(.00337)**	
G×(1-d)		**.0124*** **			**.0115** **	
		(.00376)			**(.00459)**	
Bias (B)						
B×d	**.120*** **	**.0700** **	**.119*** **	**.129*** **	**.109** **	**.129*** **
	(.0345)	**(.0325)**	**(.0349)**	**(.0408)**	**(.0424)**	**(.0406)**
B×(1-d)	**-.0562**	**-.00772**	**-.0560**	**-.0627**	**-.0580**	**-.0632**
	(.0714)	**(.0670)**	**(.0716)**	**(.0739)**	**(.0813)**	**(.0748)**
d = I(B>0)	**-.108***	**.342** **	**-.109**	**-.101**	**.217**	**-.102**
	(.0640)	**(.150)**	**(.0648)**	**(.0677)**	**(.202)**	**(.0680)**
Left				.0485	.0704	.0486
				(.0354)	(.0598)	(.0354)
Unstable				.0399	.0253	.0410
				(.0330)	(.0478)	(.0332)
Indust	-.108**		-.106**	-.137**		-.141**
	(.0483)		(.0485)	(.0653)		(.00660)
E. Eur	.268***			.246***	.0897	
	(.0703)			(.0756)	(.0923)	
S. America	.106**		.105**	.0794	.0610	.0822
	(.0500)		(.0499)	(.0494)	(.0585)	(.0494)
Openness	-.000637	-.00198***	-.000589	-.000665	-.00141**	-.000598
	(.000408)	(.000578)	(.000403)	(.000426)	(.000623)	(.000428)
Urbanisation		.00218***		.000999	.000555	-.000848
		(.000763)		(.000916)	(.00192)	(.000942)
Real PC GDP				.000000330	.0000105	.00000120
				(.00000547)	(.0000134)	(.00000563)
Constant	-.144	-.291**	-.157*	-.217**	-.299*	-.227**
	(.0893)	(.132)	(.0911)	(.0975)	(.153)	(.0991)
R^2	.60	.53	.58	.65	.62	.63
F-Statistic	8.49***	3.20**	8.02***	6.85***	3.14***	6.77***
Observations	53	35	51	53	35	51
F_0 (G)	2.11	5.36**	1.71	1.82	2.02	1.39
F_1 (B)	4.35**	3.52*	4.41**	3.00*	2.75	3.17*
F_2 (G, B, d)	5.53***	3.29**	5.32***	4.43***	4.85***	4.20**
B = 0: %ile	72	58	74	72	58	74

Gini (1981-2000) instrumented by Gini (1961-80). SEs reported are robust.
Controls in 'Preferred Specification' regressions selected using following criteria:

(1) Create set of regression equations where all included controls are individually significant at the 10% level;
(2) Select from among these equations the equation that minimises the root mean square error (RMSE).

'Full Controls' regression results also shown as a robustness check.
Significance level of individual regressors and of the overall equation denoted by ***:1%; **:5%; *:10%.

[10] Test of joint significance F_2 rejects equality of coefficients, but individual significance tests for Gini and Bias do not reject equality of coefficients. Hence, unrestricted results reported.

Table 2: 2SLS Regressions with Income Tax Revenues [% GDP] (1981-2000 average) as DV

	Preferred Specification			Full Controls		
	Full Sample	Dev/Trans Economies	Excluding E. Europe	Full Sample	Dev/Trans Economies	Excluding E. Europe
Gini (G)	**-.00181* (.000955)**	**-.00212** (.000838)**	**-.00126**	**-.00118 (.00131)**	**-.00183 (.00126)**	**-.00116 (.00129)**
G×d						
G×(1-d)						
Bias (B)	**-.0174** (.00669)**	**-.00491 (.00962)**		**-.0105 (.0101)**	**-.00319 (.0113)**	**-.0108 (.0100)**
B×d			**-.0000273 (.0197)**			
B×(1-d)			**-.0400*** (.0138)**			
d = I(B>0)			**.00301 (.0160)**			
Left	-.0240* (.0138)		-.0307* (.0154)	-.0300 (.0134)	-.0207 (.0162)	-.0299* (.0162)
Unstable	-.0279** (.0103)		-.0214** (.00937)	-.0280** (.0119)	-.0253* (.0130)	-.0279** (.0119)
Indust				.0186 (.0283)		.0184 (.0282)
E. Eur				.0143 (.0211)	-.0187 (.0282)	
S. America				-.0168 (.0243)	.00239 (.0244)	-.0166 (.0243)
Openness				-.000155 (.000163)	-.000227 (.000207)	-.000150 (.000167)
Urbanisation	.000694** (.000264)		.000607** (.000249)	.000865* (.000456)	-.000460 (.000674)	.000853* (.000465)
Real PC GDP		.00000754*** (.00000264)		-.000000783 (.00000235)	.0000114** (.00000549)	-.000000717 (.00000240)
Constant	.103*** (.0366)	.0893** (.0323)	.0714* (.0366)	.0866* (.0488)	.117** (.0482)	.0858* (.0483)
R^2	.55	.38	.59	.61	.52	.60
F-Statistic	12.55***	5.13***	9.46***	16.53***	4.07***	10.2***
Observations	52	34	50	52	34	50
F_0 (G)	.004	.267	.571	.164	.0718	.187
F_1 (B)	1.14	1.08	3.02*	.643	1.44	.665
F_2 (G, B, d)	.745	.584	1.51	.255	1.08	.267
B = 0: %ile	73	60	75	73	60	75

All regressions contain the sample for Tables 1 and 3 excluding Tanzania.
Gini (1981-2000) instrumented by Gini (1961-80).
SEs reported are robust.
Controls in 'Preferred Specification' regressions selected using following criteria:

(1) Create set of regression equations where all included controls are individually significant at the 10% level;
(2) Select from among these equations the equation that minimises the root mean square error (RMSE).

'Full Controls' regression results also shown as a robustness check.
Significance level of individual regressors and of the overall equation denoted by ***:1%; **:5%; *:10%.

Table 3: 2SLS Regressions with Government Final Consumption [% GDP] (1981-2000 average) as DV

	Preferred Specification			Full Controls		
	Full Sample	Dev/Trans Economies	Excluding E. Europe	Full Sample	Dev/Trans Economies	Excluding E. Europe
Gini (G)	**.0000467**	**.000244**	**.000220**	**.000242**	**-.0000313**	**.000312**
	(.000920)	**(.000929)**	**(.00108)**	**(.00124)**	**(.00158)**	**(.00122)**
G×d						
G×(1-d)						
Bias (B)		**-.00195**		**.00131**	**.00543**	**.00115**
		(.0159)		**(.0124)**	**(.0119)**	**(.0123)**
B×d	**.0408***		**.0416***			
	(.0207)		**(.0241)**			
B×(1-d)	**-.0511****		**-.0217**			
	(.0197)		**(.0211)**			
d = I(B>0)	**-.00994**		**-.0222**			
	(.0190)		**(.0182)**			
Left				.0196	-.00214	.0196
				(.0201)	(.0228)	(.0199)
Unstable		-.0375**	-.0230**	-.0288**	-.0385**	-.0285**
		(.0159)	(.0110)	(.0140)	(.0186)	(.0140)
Indust				.0294		.0285
				(.0510)		(.0509)
E. Eur				-.0412	-.0578	
				(.0305)	(.0520)	
S. America	-.0359*			-.0271	-.0385	-.0263
	(.0182)			(.0294)	(.0326)	(.0294)
Openness				-.00000576	-.000373	.0000138
				(.000360)	(.000404)	(.000373)
Urbanisation	.00101**			.000903	.00104	.000859
	(.000414)			(.000576)	(.000962)	(000586)
Real PC			.00000458***	.000000205	.00000189	.000000460
GDP			(.00000163)	(.00000345)	(.0000102)	(.00000355)
Constant	.0627*	.137	.101**	.0901*	.121*	.0872
	(.0348)	(.0374)	(.0418)	(.0524)	(.0653)	(.0523)
R^2	.52	.14	.51	.52	.33	.51
F-Statistic	10.0***	2.10	10.1	6.89***	.870	7.56***
Observations	53	35	51	53	35	51
F_0 (G)	.0000295	.713	.0915	.114	.0167	.0571
F_1 (B)	11.60***	1.77	3.73*	1.03	1.50	1.10
F_2 (G, B, d)	4.35***	1.12	1.50	.995	.814	.979
B = 0: %ile	72	58	74	72	58	74

Gini (1981-2000) instrumented by Gini (1961-80).
SEs reported are robust.
Controls in 'Preferred Specification' regressions selected using following criteria:

(3) Create set of regression equations where all included controls are individually significant at the 10% level;
(4) Select from among these equations the equation that minimises the root mean square error (RMSE).

'Full Controls' regression results also shown as a robustness check.
Significance level of individual regressors and of the overall equation denoted by ***:1%; **:5%; *:10%.

About the project

This OCGG Economy Analysis is part of a series of publications stemming from the OCGG Economy Section's Development and Fiscal Policy project, by early career-stage researchers currently studying and working at leading universities around the world. The central theme is the reassessment of fiscal policy priorities in development.

The project seeks to assess the prospects for poorer countries moving towards stable and sustainable long-term paths on which governments are able to pursue poverty reduction and broader human development goals through the exercise of fiscal policy. Advice for bilateral and multilateral donors will focus on the nature of development assistance provided and on the policy priorities pursued.

The project combines different approaches, leading to research that:

- assesses the experience of specific countries (from Mexican social policy to Kenyan tax administration, from Argentinean inequality to Zambia's use of aid revenues);

- considers the drivers of policy change at national and international level, including a careful case-study assessment of IFI recommendations for fiscal policy made to countries at different levels of income;

- offers new theoretical perspectives (e.g. on political inequality and inflation as a tax, and the decomposition of poverty changes into their growth and inequality components); and

- carries out analysis on newly assembled data (e.g. on the components and nature of redistribution in rich countries).

All work, both advice and underlying research, is made available via our website, at

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The OCGG Economy Section will publish an issue of the Oxford Journal on Good Governance, which will be devoted to the themes of this project. It will include contributions from high-profile external contributors from academia and policy, as well as showcasing OCGG policy advice. Since all of the OCGG's operations – including research, advice and publications – are funded by donation, project sponsors are sought. To get involved with the project, visit the website or contact the section director Alex Cobham at alex.cobham@oxfordgovernance.org.