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Does inequality cause inflation?: The political economy of inflation, taxation and government debt *

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Abstract. A democratic society in which the distribution of wealth is unequal elects political parties that are likely to represent the interests of poor people. It is in the interests of the clientele of the resulting governments to attempt to levy inflation taxes in order to erode the real value of debt service and redistribute from the rich to the poor. Consequently, inequality and high levels of nominal government debt sow the seeds for inflation. Some cross-country evidence for this proposition is provided.

1. Introduction

Differences in inflation rates across countries, even with similar economies, such as Northern European democracies, are a major puzzle for economists. A standard explanation originates from the public finance literature. Given the need to finance a given amount of government revenues, the government has the option of financing these revenues either through (non-monetary) taxes or through seigniorage (e.g., Phelps, 1973; Mankiw, 1987). The optimal revenue mix is tilted more towards seigniorage if the ruling political party has less of a dislike for inflation, if the costs of collecting taxes are high and the extent of tax evasion is widespread (cf. Canzoneri and Rogers, 1990), and if the financial system is relatively repressed (e.g., Roubini and Sala-i-Martin, 1992). Inflation will then be relatively high and income tax rates relatively low. If the central bank is not independent and the government cannot commit itself to the announced future monetary stance, discretion rather than rules is the relevant outcome so that seigniorage will be relatively more important than tax revenues (Barro and Gordon, 1983; Barro, 1983; van der Ploeg, 1991). Lack of monetary discipline and credibility thus provide an additional

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incentive for inflation in a situation of outstanding nominal government debt or nominal wage contracts.

These are just the standard economic linkages. So far, however, little attention has been paid to political explanations for observed differences in inflation rates. To understand the political economy of inflation and taxation, one must allow for heterogeneity in nominal debt holdings among agents. Heterogeneity arises when different private agents have different labour productivities and thus build up different stocks of assets for their retirement. An unequal society means that a relatively large part of the government debt is in the hands of a relatively small group of individuals. When this society is democratic, it thus elects a political party that represents the interests of poor people. Such a party has more of an incentive to levy inflation taxes and erode the real value of debt service, because this hurts the rich more than the poor. We show that in a democracy inequality and nominal government debt sow the seeds of inflation.[1]

Recently, other theories have been put forward which emphasize the relationship between the degree of political instability and polarisation, and inflation. Cukierman, Edwards, and Tabellini (1992) test a political model of tax reform on 79 countries and find that political instability is positively associated with inflation. Another theory is that of "populist policy cycles," a typical Latin American way of policymaking, where deep inequality and social unrest sow the seeds for policies of redistribution and expansion by reactivation. In the longer run, when the economies run into bottlenecks and foreign reserves get depleted, these policies become unsustainable and inflation explodes (e.g., Sachs, 1989; Dornbusch and Edwards, 1989). Why stabilization is so often delayed in reality, even though all parties in a social conflict find stabilization desirable, can be explained by "wars of attrition" (Alesina and Drazen, 1991). Inflation is high as long as none of the groups concedes and takes up the (tax) bill of reform.

These theories seem more appropriate for explaining differences in inflation among non-democracies, because these countries show larger variations in the degree of polarization of their societies and the degree of political instability. They seem, however, less appropriate to account for differences in inflationary experience among democracies. Thus, the analysis we put forward in this paper may be seen as complementary to these other theories.

The remainder of the paper is as follows. Sections 2 and 3 establish, within the context of a public-finance model of tax and seigniorage smoothing with heterogeneous agents, the proposition that inflation is high in democratic countries with a lot of inequality and high nominal government debt. Although the analysis restricts attention to only one nominal asset (i.e., government debt), in principle this explanation holds for any nominal asset which

is distributed unequally across the electorate. Section 4 briefly discusses the other recent theories of inflation mentioned above. Section 5 provides empirical evidence of a positive association between inflation and income inequality for a cross-section of democracies. This association is robust against the underlying sample period, reverse causation and extensions in which proxies for political instability and polarization are included. Corresponding regressions for a cross-section of non-democracies show no evidence of any relation between inflation and inequality.

2. Taxation, seigniorage, government debt and private consumption

For simplicity, attention is focused on steady streams of primary government spending. In that case one can restrict the analysis to the steady state. The qualitative character of the results is unaffected if a transient analysis is conducted, because households want to smooth their consumption over time and the government wants to smooth tax and seigniorage revenues over time (cf. Barro, 1979; Mankiw, 1987). This latter results only holds when the velocity of circulation of money is constant, because otherwise the government has an incentive to finance permanent increases in government spending by interest on government assets built up through temporary bouts of taxation and inflation (Obstfeld, 1991; van der Ploeg, 1991, 1995).

Households consume their income, which consists of income from production plus interest income minus taxes and seigniorage. Household i thus faces the budget constraint[2]

$$C_i = Y_i + (r - n)D_i - T_i - S_i \tag{1}$$

where C_i, Y_i, D_i and S_i denote consumption, pre-tax income, holdings of government debt, taxes and seigniorage extracted by the government for household i, respectively, r denotes the ex-post real interest rate and n denotes the growth rate in output. To make the point of this paper as simple as possible, assume that all households receive the same income and pay the same amount of taxes and seigniorage. For those variables the subscript i can be dropped. The only source of heterogeneity among households is thus differences in holdings of assets: some households hold a lot of government debt, whereas other households hold little or no government debt. There are N households. The government must finance its primary level of spending plus interest payments on outstanding debt through extraction of tax and seigniorage revenues:

$$N\,G + (r - n)N\,D_A = N(T + S) \tag{2}$$

where $D_A \equiv (D_1+..+D_N)/N$ denotes the average level of government debt held by households and G denotes the exogenous per-capita level of government spending. The condition for equilibrium in the goods market is

$$N\,C_A + N\,G = N\,Y \tag{3}$$

where $C_A \equiv (C_1+..+C_N)/N$ denotes the average level of private consumption.

Four behavioural assumptions are needed. First, the ex-ante real rate of interest is constant, denoted by ρ, and follows from preferences and technology. It is assumed that ρ exceeds the real growth rate n. Second, the Fisherian hypothesis is adopted so that the nominal interest rate is simple the sum of the ex-ante real interest rate and the expected rate of inflation. It follows that the ex-post real interest rate is given by

$$r = \rho + \pi^e - \pi \tag{4}$$

where π and π^e denote the actual and expected inflation rate, respectively. Third, the quantity theory of money is adopted so that the demand for real money balances is a constant proportion, say m, of output:

$$M/P = m\,Q \tag{5}$$

where M, P and Q denote per-capita nominal money balances, the price level and the non-distortionary per-capita level of output, respectively. It follows that the rate of inflation is equal to the excess of monetary growth over the real growth rate of the economy, that is $\pi \equiv \Delta P/P = \mu - n$ where $\mu \equiv \Delta M/M$, and that seigniorage extracted from an individual household is given by $S \equiv \mu(M/P) = (\pi+n)mQ$. Fourth, the growth rate of the economy, $n \equiv \Delta Q/Q$, is exogenous and there are output losses arising from taxation and inflation. More specifically, pre-tax income is assumed to be given by (e.g., Obstfeld, 1991)

$$Y = Q[1 - \tfrac{1}{2}\kappa_1 t^2 - \tfrac{1}{2}\kappa_2(\pi + \rho)^2],\ \kappa_1, \kappa_2 \geq 0 \tag{6}$$

where $t \equiv T/Q$ denotes the (non-monetary) tax rate. The deadweight losses are quadratic in the tax and inflation rates. The non-distortionary tax rate is zero, whilst the non-distortionary inflation rate is minus the (ex-ante) real interest rate ($-\rho$) as the full liquidity rule says that the nominal interest rate should be driven to zero. The non-distortionary level of monetary growth is $-(\rho-n)$.

3. Unequal distribution of government assets causes inflation

Households obtain utility from both private and public consumption. Utility of household i is given by $C_i + G$. The political party that is elected into office represents the interest of the median voter. It is easy to see that, under the discretion outcome (see below), individual (indirect) preferences are single-peaked in the money growth rate, while the individually most preferred money growth rate is strictly decreasing in the relative amount of individual debt holdings. The Median Voter Theorem then implies that in a direct pairwise vote the selected policy mix is the one that is preferred by the median debt holder (e.g., Atkinson and Stiglitz, 1980). The implicit assumption here is that for each type (in terms of relative wealth) of agent there exists a candidate for government who represents the interests of this agent. Note that, under the rules outcome, indirect preferences are the same for all agents (see also below).

The government thus chooses monetary and fiscal policy (μ and t) to maximize the utility of the median voter (expressed as a fraction of the non-distortionary level of output),

$$\begin{aligned}&[C_M + G]/Q = (C_M - C_A + Y)/Q = \\ &1 - \tfrac{1}{2}\kappa_1 t^2 - \tfrac{1}{2}\kappa_2(\mu + \rho - n)^2 + (\rho + \mu^e - \mu - n)(d_M - d_A),\end{aligned} \tag{7}$$

subject to the government budget constraint,

$$g + (\rho + \mu^e - \mu - n)d_A = t + \mu m, \tag{8}$$

where $d \equiv D/Q$, $g \equiv G/Q$ and the subscript $_M$ denotes the median household as far as the dispersion of private wealth is concerned. The gap between the mean and the median of the distribution of the assets throughout the population is a measure of the degree of inequality in wealth holdings in the sense that this indicates that few people hold most of the assets.

3.1. *Rules*

Two outcomes should be distinguished: rules and discretion (denoted by superscripts ^{R} and ^{D}, respectively). Rules presumes that the government is able to commit itself or, alternatively, has sufficient reputation for the private sector to firmly believe its announcements about future policy. Under rules the government can influence the expectations of private agents and can thus take $\pi^e = \pi$ or $\mu^e = \mu$ as given when determining its optimal monetary and fiscal policies. It follows that:

$$t^R = (\kappa_1 m^2 + \kappa_2)^{-1}\kappa_2[k + (\rho - n)m] \tag{9}$$

$$\mu^R = (\kappa_1 m^2 + \kappa_2)^{-1}[\kappa_1 m\, k - \kappa_2(\rho - n)] \tag{10}$$

where $k \equiv g + (\rho\text{-}n)d_A$ denotes (the annuity value of) the government's need for funds. As the government's need for funds increases, it is optimal to raise both the tax and monetary growth rate (cf. Mankiw, 1987). As a consequence, the inflation rate and seigniorage revenues increase whilst private consumption falls. An increase in the output costs of taxation arising from a less efficient tax system or a fall in the output costs of inflation boost the optimal rates of monetary growth and inflation and reduce the optimal tax rate. A fall in the growth-corrected real interest rate (ρ–n) has similar effects, because it raises the non-distortionary level of monetary growth as given by the full liquidity rule. A more repressed financial system implies that households need more money balances (higher m) and thus increases the base for raising seigniorage revenues. This induces a shift in the optimal government revenue mix away from tax towards seigniorage revenues. Due to the fact that the non-distortionary level of inflation is minus the ex-ante real interest rate, there is an opposite effect leading to a bias in favour of non-monetary tax revenues. Finally, note that the rules outcome for the optimal tax and inflation rate is independent of the manner in which assets are distributed throughout the population. The intuition is that under rules the government is pre-committed not to levy an inflation tax, so that inflation does not affect the (growth-corrected) real return on assets held by the median voter and thus the measure of inequality (d_A–d_M) does not affect the utility of the median voter.[3]

3.2. *The political economy of discretion*

The rules outcome is time inconsistent in the sense that once the private sector is fooled into believing that monetary growth and inflation will be low, the government has an incentive to levy a surprise inflation tax. By doing this the government erodes the real value of its debt service and can thus reduce the output costs of taxation. In rational expectations equilibrium the private sector anticipates that the government has such an incentive and thus inflation will be higher. Discretion may be more relevant in practice, since it is relevant if the government cannot commit itself to its announced intentions about future policies. This is likely to be the case in democracies with frequent elections in which the incumbent political party cannot bind the hands of its successor. Discretion implies that the government must take π^e and μ^e as given when determining its optimal policies. It follows that:

$$t^D = [\kappa_1 m(m+d_A)+\kappa_2]^{-1}\{\kappa_2 k+[\kappa_2(\rho-n)-(d_A-d_M)]m\} < t^R, \tag{11}$$

$$\mu^D = [\kappa_1 m(m + d_A) + \kappa_2]^{-1}[\kappa_1(m + d_A)k - \kappa_2(\rho - n) + (d_A - d_M)] > \mu^R. \tag{12}$$

Because the government has no reputation and cannot commit itself, the private sector does not believe announcements about low monetary growth. It follows that under discretion the welfare of the median voter is lower than under rules and the government revenue mix is sub-optimal in the sense that the tax rate is too low and the inflation rate is too high. Basically, the presence of government debt provides an open invitation to wipe it out with surprise inflation and thus lowers the cost of seigniorage.

The distribution of assets matters for the optimal tax and monetary growth rates. The more unequal wealth is distributed throughout the population, i.e., the more the mean exceeds the median of the distribution of assets throughout the population, the higher monetary growth and inflation and the lower the tax rate. The idea is that when assets are very unfairly distributed throughout the population the median voter is more likely to be poor so that in a democracy the political party in office will represent the interests of the poorer segments of the population. Such a party will find it in the interests of its clientele to levy inflation taxes in an attempt to take from the rich in order to lower (non-monetary) taxes for all. Hence, an unfair distribution of wealth carries the seeds of high inflation.

The limited empirical evidence that is available suggests that median asset holdings are usually fairly low, so that asset holdings tend to be concentrated among a relatively small group of agents. Still the distribution of assets matters for the median asset holder as expression (12) shows. Even if $d_M = 0$, a more unequal distribution of assets leads to more inflation, because the relevant measure of inequality is $(d_A – d_M)$. The reason is that an increase in $(d_A – d_M)$ implies more redistribution towards the median voter at any given inflation rate.

The government is ex post unable to redistribute from the rich to the poor, given that all contracts are indexed to the price level, so that both rich and poor are worse off when the government cannot commit. Utility of household i can be written as

$$c_i + g = 1 - \tfrac{1}{2}\kappa_1 t^2 - \tfrac{1}{2}\kappa_2(\mu + \rho - n)^2 + (\rho - n)(d_i - d_A), \tag{13}$$

so that rich households have higher utility than poor households. Also, households with identical holdings of assets experience a higher level of utility under rules than under discretion and their utility under discretion is higher when assets are more equally distributed in society, ceteris paribus.

3.3. *Intertemporal considerations*

The discretionary outcome described above assumes that the government has a zero commitment period. However, if expected time to replacement of the government is long enough, other equilibria with lower inflation may be possible. These equilibria may be sustained by trigger strategies (e.g., Rogoff, 1989), where, if the government deviates from earlier announcements of low inflation, it is punished by future periods of expectations of high inflation. The temptation to renege on its earlier promises increases when the government's term of office comes to an end, and when there is a high probability of replacement. However, to analyse these issues in a proper intertemporal framework, one also needs to allow for the dynamics of wealth accumulation. Although the median voter may reap the benefits of expropriation in one period, this will affect the distribution of assets and thus the optimal inflation rate in ensuing periods (compare the dynamic analysis of capital taxation by Alesina and Rodrik, 1994). In particular, the distribution of assets may become more equal and thus the optimal inflation rate may gradually fall over time. The detailed analysis of the dynamics of the distribution of assets and inflation is left for future research.

4. Other recent theories of inflation

Cukierman, Edwards, and Tabellini (1992) develop a model in which two political parties disagree about the composition of government spending and the party which holds tenure in the current period can choose the efficiency of the tax system (which thus becomes a strategic variable) in the next period. The model predicts that a higher degree of polarization and a higher probability of replacement of the current government leads to the choice of a less efficient tax system, so that a larger part of government spending has to come from seigniorage revenues. Controlling for a set of structural economic variables (in order to proxy differences in tax collection costs), seigniorage as a percentage of total government revenues is found to be positively related to a variety of proxies for political instability and polarization.

Other explanations of (temporarily) high inflation have been put forward by Sachs (1989) and Dornbusch and Edwards (1989), who study populist policy cycles, a typically Latin American type of policymaking. Examples are the experiences of Chile under Allende and Peru under Garcia (Sachs, 1989), and of Argentina under Peron and Brazil under Sarney (Dornbusch and Edwards, 1989). The hope of populist policies is to promote development without escalating class conflict by making use of idle capacity. The actual policies involve reactivation with redistributive measures and an expansion of

aggregate demand. In addition, an appreciation of the real exchange rate and a reduction in export-promoting measures are used to transfer income from rich to poor. Effectively, rich owners of primary resources find it harder to sell their product abroad while poor urban workers see an increase in their real wage. To avoid inflationary pressures and preserve the real value of the real wage and living standards, price controls are put in force and the nominal exchange rate is pegged. The extra demand is met through running down inventories and imports. The exchange rate is defended through selling foreign reserves. Eventually, the economy runs into bottlenecks as inventories and foreign reserves run out. Populist policies are thus doomed to fail in the longer run as capital flight and inflation rise steeply. Speculative attacks on the currency induce a huge depreciation of the exchange rate, both in nominal and in real terms, and further fuel inflation. As a by-product there is an increasing degree of dollarization, which erodes the base for inflationary taxation and requires the government to push up inflation even further in order to meet it expenses. The main lesson from these studies is that Latin American societies have, in contrast to the more corporatist societies of Northern Europe, a lot of social unrest and inequality which provide fertile grounds for populist policies. In a sense, this provides a complementary explanation to the one put forward in Sections 2 and 3 of why societies with a large degree of inequality eventually end up with high inflation.

The theory on "wars of attrition" between social groups (Alesina and Drazen, 1991) might explain why in reality stabilization programmes are delayed so frequently and a high inflation rate may persist for so long, despite the fact that all parties in a social conflict find stabilization desirable. Groups are waiting each other out, until one concedes and bears a disproportionate share of the burden. Alesina and Drazen (1991) show that the higher the degree of polarization, the later is the expected date of stabilization. Also, policies that reduce the costs associated with inflation may be counterproductive as they make it more difficult to reach agreement on undertaking painful steps to fight inflation itself. Countries may need to suffer considerable inflation before fiscal policies are adopted that are consistent with a stable price level (Drazen and Grilli, 1993).

5. Cross-country evidence on inflation, inequality and government debt

Figures 1a and 1b depict average producer price inflation (PPI6085) against income inequality around 1960 (M60) for a set of 23 democracies and 43 non-democracies, respectively (listed in Table 1).[4] Since data on the distribution of nominal wealth are not available for a wide cross-section of countries,

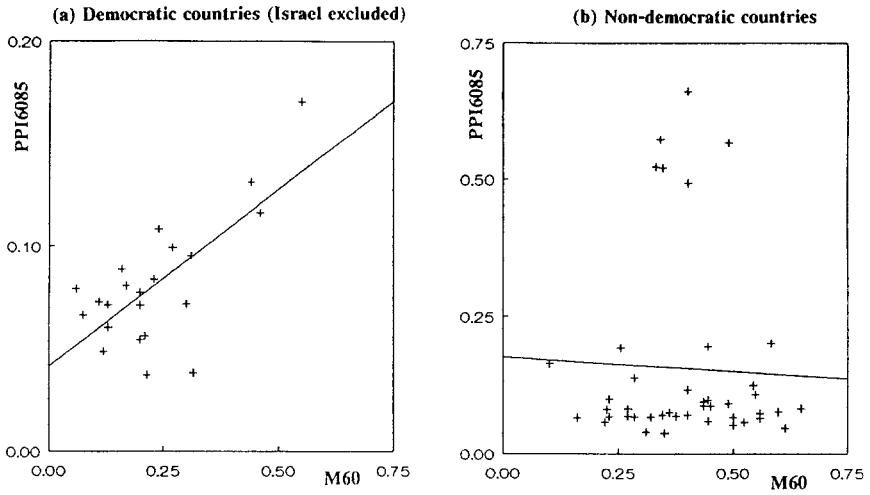

Figure 1. Average producer price inflation 1960–1985 versus income inequality around 1960.

the inequality measure is based on data for the distribution of income per head, taken from Alesina and Rodrik (1994). The sparse evidence available (in particular for the U.S.; see Kessler and Wolff, 1991; and Wolff, 1979 and 1994) suggests a positive correlation between income and wealth holdings as well as a positive correlation between nominal wealth holdings and total wealth holdings. In particular, the poor tend to be net debtors, while the rich tend to be net creditors. The measure of inequality is given by $M \equiv 1 -$ (median/mean).[5] In a society with an unequal distribution of incomes mean income exceeds median income, so the measure of inequality M lies between zero and one.

Figure 1a suggests for all democracies, except Israel, a strong link between inflation and inequality. For example, countries such as Columbia (M60 = 0.550; PPI6085 = 0.1703) and Costa Rica (M60 = 0.440; PPI6085 = 0.1309) and, to a lesser extent, Jamaica (M60 = 0.460; PPI6085 = 0.1161) combine a high degree of inequality with high inflation rates. Israel, being a remarkably egalitarian society with very high inflation rates (M60 = 0.070; PPI6085 = 0.4565), is an outlier and was thus excluded. Table 2 presents cross-country regressions of the average producer and consumer price inflation over the period 1960–1985 on a constant and a measure of inequality around 1960. In the regressions there is, at the 5 percent level, a significant positive effect of inequality on inflation. Table 2 also shows, for the same cross-section of

Table 1. List of countries

(a) Democracies				
Austria	France	Japan	Sri Lanka	
Canada	Germany	Malaysia	Sweden	
Colombia	India	Netherlands	United Kingdom	
Costa Rica	Israel	New Zealand	United States	
Denmark	Italy	Norway	Venezuela	
Finland	Jamaica	Spain		
(b) Non-democracies				
Argentina	Egypt	Ivory Coast	Pakistan	Tanzania
Bangladesh	El Salvador	Kenya	Panama	Thailand
Bolivia	Gabon	Korea	Peru	Trinidad & Tobago
Botswana	Guatemala	Madagascar	Philippines	Tunisia
Brazil	Honduras	Malawi	Senegal	Uganda
Burma	Hong Kong	Mexico	Sierra Leone	Uruguay
Chad	Indonesia	Morocco	South Africa	Zambia
Chile	Iran	Niger	Sudan	
Dominican Republic	Iraq	Nigeria	Taiwan	

democracies, the results of the regression of average producer price inflation over the period 1980–1985 on a constant and inequality aroung 1980. These results confirm the strong positive association between inflation and inequality found earlier.

Inspection of Figure 1b reveils no relationship between producer price inflation and inequality for our sample of non-democracies. This is confirmed by the results (not reported here) of regressions of the two measures of inflation on a constant and M60 for the entire sample and various subsamples. Perhaps, this is not surprising as the model put forward in Sections 2 and 3 applies to democratic countries. Non-democratic countries such as South Africa (M60 = 0.490; PPI6085 = 0.0904), Honduras (M60 = 0.525; PPI6085 = 0.0578) and El Salvador (M60 = 0.560; PPI6085 = 0.0648) are capitalist dictatorships which seem to protect the interests of rentiers and combine high degrees of inequality with low inflation.

Additional tests for the robustness of the results just discussed are presented in Table 3.[6] First, we investigated whether the positive association between (producer price) inflation and inequality was still preserved when adding variables that proxy political instability or polirization, as suggested by Cukierman, Edwards, and Tabellini (1992). A variety of variables from the dataset of Barro and Wolf (1989) was used, such as the average number

Table 2. Cross-country regressions of inflation on inequality and government debt

	Constant	M60	M80	D6085	JB	R^2	$\bar{R}^2$
PPI6085	0.041	0.173	–	–	2.69	0.49	0.461
	(3.93)	(4.35)	–	–			
	[4.18]	[3.94]	–	–			
PPI8085	0.011	–	0.424	–	8.01	0.34	0.302
	(0.41)	–	(3.18)	–			
	[0.41]	–	[2.08]	–			
PPI6085*	–0.006	0.165	–	0.173	0.61	0.83	0.811
	(–0.34)	(2.59)	–	(9.80)			
	[–0.32]	[2.04]	–	[8.24]			
CPI6085	0.047	0.164	–	–	3.25	0.48	0.451
	(4.70)	(4.27)	–	–			
	[5.11]	[3.98]	–	–			
CPI8085	0.034	–	0.424	–	6.96	0.34	0.307
	(1.28)	–	(3.21)	–			
	[1.29]	–	[1.98]	–			
CPI6085*	0.000	0.155	–	0.174	0.76	0.82	0.806
	(0.01)	(2.39)	–	(9.66)			
	[0.01]	[1.99]	–	[7.89]			

M60 Measure of inequality for 1960
M80 Measure of inequality for 1980
PPIxxyy Geometric average of annual inflation rates in producer prices during 19xx–19yy.
CPI6085 Geometric average of annual inflation rates in consumer prices during 1960–1985.
D6085 Arithmetic average of government debt-GDP ratio's during 1960–1985.

Source: M60 and M80, Alesina and Rodrik (1994).
PPI6085, CPI6085, Summers and Heston (1988) and OECD Main Economic Indicators.
D6085, IMF International Financial Statistics.

Note. Standard t-ratios are given in round brackets.
T-ratios based on White's heteroskedasticity-consistent standard errors are given in square brackets.
JB = Jarque-Bera test for normality, which is chi-square distributed under the null hypothesis with two degrees of freedom.
*Regressions are with Israel included.

of assassinations per capita, constitutional changes, revolutions, revolutions and coups, riots, strikes and crises. For the democracies, none of these variables turned out to be significant and none of them was able to wipe out the strong positive link between inflation and inequality. One reason might, of course, be that the variables just mentioned are only rough proxies for political instability and polarization. In the corresponding regressions for our set of non-democracies the coefficients of these proxies generally came out with the predicted theoretical signs and were close to or significant. As before, inequality was insignificant in explaining inflation for our set of non-democratic countries. Finally, even though the results have shown a significant positive link between inflation and inequality at the start of the sample period, these findings do not of course exclude the possibility that there could be an effect of inflation on inequality. For example, rich people may have better opportunities to hedge against inflation. Hence, we subjected our set of democracies to a check on reverse causation by regressing inequality around 1980 on a constant, inequality around 1960 and average inflation between 1960 and 1980, in order to see whether inflation could explain changes in equality over the period 1960–1980. Inequality around 1960 turned out to be highly significant, while inflation was far from significant, thus suggesting no effect from inflation on inequality.

The theory put forward in Sections 2 and 3 to explain the link between inequality and inflation is based on the idea that the presence of an outstanding stock of nominal government debt provides an open invitation for the government to wipe out the real value of its debt through inflation.[7] To test whether there is empirical evidence for the proposition that in a democracy both inequality and government debt raise inflation[8] and to see whether the experience of Israel can be explained, Table 2 also presents the relevant cross-country regressions for the democratic countries with Israel included. It is remarkable that the explanatory power of the regressions is much increased, that the effect of inequality on inflation is almost the same order of magnitude as before and remains significant, and that the ratio of government debt to GDP exerts a strong and significant additional influence on inflation. The very high inflation rate of Israel is thus primarily a consequence of its very high ratio of government debt to GDP (2.36), so that the negative effect on inflation caused by the egalitarian nature of Israel's society is not sufficient to off-set the positive effect of government debt. Conversely, fairly inegalitarian societies such as Germany or Japan (M60 of 0.315 and 0.210, respectively) have nevertheless fairly low inflation rates (PPI6085 of 0.0379 and 0.0562, respectively) due to their modest ratio's of government debt to GDP (D6085 of 0.1126 and 0.1030, respectively).

Table 3. Robustness of the link between inflation and inequality in democratic countries against adding political instability and polarization variables

	ASSASS	CONST	CRISES	RCOUP	RIOT	STRIKE
Constant	0.039	0.040	0.040	0.041	0.042	0.039
	(3.65)	(3.82)	(3.20)	(3.74)	(3.67)	(3.65)
	[3.57]	[3.93]	[3.36]	[3.95]	[3.96]	[3.75]
M60	0.168	0.164	0.174	0.173	0.172	0.169
	(4.19)	(3.93)	(3.62)	(4.25)	(4.20)	(4.18)
	[3.55]	[3.30]	[3.20]	[3.86]	[3.84]	[3.64]
R^2	0.512	0.500	0.453	0.487	0.488	0.497
JB	2.19	2.17	2.60	2.67	3.05	2.39

ASSASS Number of assassinations per million population per year (1960–1985 or subperiod).
CONST Number of constitutional changes (1960–1985 or subperiod).
CRISES Number of government crises per year (1960–1985 or subperiod).
RCOUP Number of revolutions and coups per year (1960–1985 or subsample).
RIOT Number of riots per year (1960–1985 or subperiod).
STRIKE Number of strikes per year (1960–1985 or subperiod).

Source: Banks (1979).

Note. Each column lists the coefficient estimates of the constant and M60 when the variable listed at the top of the column is added to the standard regression for PPI6085.
Standard t-ratios are given in round brackets.
T-ratios based on White's heteroskedasticity-consistent standard errors are given in square brackets.
JB = Jarque-Bera test for normality.
In the regressions for CRISES Jamaica and Venezuela were missing.
Israel is excluded; dependent variable is PPI6085.

The cross-country regressions for the democratic countries suggest that the difference in the inflation rates of an egalitarian society for which M is close to zero and an inegalitarian society for which M is around 0.5 is about eight percentage points. The regressions also suggest that a rise in the ratio of government debt to GDP by about six percentage points raises inflation by one percentage point. These stylized empirical facts provide some motivation for the analysis of Sections 2 and 3.

Our steady-state analysis presumed that the distribution of nominal wealth across the electorate is constant. This presumption may not be too bad, since the data suggest a strong relationship between inequality around 1960 and

inequality around 1980. Nevertheless, in future research it is desirable to allow for dynamics in the distribution of wealth.

6. Conclusion

Cross-country evidence on a positive link between inflation and income inequality for democratic countries has been presented. The regressions suggest that the difference in inflation rates of a country in which all individuals earn the same and a country in which the median income is half of average income is about eight percentage points. The regressions also suggest that a rise in the ratio of government debt to GDP by about six percentage points raises inflation by one percentage point.

These results may be explained by a model in which an unequal dispersion of wealth sets the political conditions for high inflation and low tax rates. When assets are unequally distributed in society, the government is more likely to represent the interests of the poor and thus finds it harder to commit itself to a policy of low inflation. When the analysis is extended to allow for overlapping generations one can show that a society dominated by young people will elect political parties that are in favour of taxing the elderly by eroding the real value of their return on accumulated savings and lowering taxes for the population at large. However, many countries of the OECD are experiencing a greying of the population so that one might expect lower inflation and higher tax rates in the years to come. The ideas put forward in this paper apply to democracies, but it is not difficult to extend the argument to non-democratic countries. Populist dictatorships are likely to serve the interests of the working classes and to induce high inflation rates whilst capitalist dictatorships are more likely to protect the interests of rentiers and ensure low inflation rates despite having high degrees of inequality.

The test of our proposition that inequality causes inflation presupposes a positive correlation between income and nominal assets holdings. Although comparable cross-section data on nominal wealth are not available and inflation might affect agents in many ways, the use of income data may not be so bad in an initial attempt to uncover the effects of inequality on inflation. One reason is that, in fact, our argument applies to the *total stock* of nominal assets, including pension claims (which are higher for agents with higher income), etcetera, in as far as these are not fully indexed for inflation. The sparse evidence that is available suggests a positive correlation between income and total nominal asset holdings, where the latter tend to be negative for low income groups (Kessler and Wolff, 1991; and Wolff, 1979 and 1994). Empirical evidence also seems to suggest that low income groups benefit relatively most from inflation (Bach and Stephenson, 1974; Hibbs,

1977; Wolff, 1979; and Lippi and Swank, 1993). Nevertheless, our empirical results should merely be interpreted as suggestive for the effects of inequality on inflation, while future empirical work should concentrate directly on this relationship, once data on the inequality of nominal wealth become available on a cross-sectional basis.

This paper has focused on the political economy of inflation in the context of a model with heterogeneity in nominal wealth. However, inflation also has real effects when wages, pensions and benefits are not fully or not immediately indexed to the price level and inflation is high. The appendix extends the basic model in the text to allow for incomplete wage indexation. The results suggest that if the degree of wage indexation is the same for all households, incomplete indexation has no (additional) distributional consequences. Incomplete indexation only affects the inflation bias. However, if indexation is easier for high than for low incomes and the poor do not have the same access to financial instruments as the rich have to shelter against inflation, inflation may hurt the poor relatively more than the rich.[9] More inequality then induces less inflation in democratic countries. Conversely, given that indexation is not perfect especially for the poor, more equality induces more inflation. However, the stylized facts collected in this paper do not support this hypothesis. A full analysis of these issues would take into account the effects of unanticipated inflation on the firms' profits and the returns to stockholders, insofar as stocks are unequally distributed across houeholds. Also, such analysis should allow for the fact that policies to protect the interests of the poor, i.e., indexation of wages, benefits and pensions, reduce the costs of inflation and induce governments to pursue policies of higher inflation and lower welfare (e.g., Fischer and Summers, 1989). Moreover, policies that reduce the costs associated with inflation may be counterproductive as they make it more difficult to reach agreement on undertaking painful steps to fight inflation itself. Countries may need to suffer considerable inflation before fiscal policies are adopted that are consistent with a stable price level (Drazen and Grilli, 1993).

In reality, redistributive platforms do not always attract the votes of those who are supposed to benefit from such policies. One reason may be that, because their number is usually rather limited, political parties represent many different groups in society. Moreover, they have to take a stand on many issues, of which redistribution is only one (albeit an important one). Another reason is that voters do not only vote on the basis of their current situation, but also on the basis of their future situation. Unfortunately, in its present form our model is too simple to fully address these issues, because in equilibrium the relative wealth position of agents remains unaltered. Future research should therefore allow for richer dynamics, for example by allowing

for a richer maturity structure of debt or other types of inequality as well. The fact that voters take into account the future path of the economy may help to explain such puzzles in voting behavior.

Notes

1. This result is related to the idea that inequality is harmful for growth (Alesina and Rodrik, 1994; Persson and Tabellini, 1992). The point being that, for a society in which wealth is unequally distributed, the median voter is relatively poor and will levy high taxes on capital and income in order to provide for transfers from the rich to the poor. Such policies damage growth prospects.
2. Given that the economy is in a steady state with growth rate n, the household budget constraint is given by $C_t = Y_t+(1+r)D_t-D_{t+1}-T_t-S_t = Y_t + (1+r)D_t-(1+n)D_t-T_t-S_t$, which simplifies to equation (1). In the sequel we omit the time index.
3. The term $(\rho+\mu^e-\mu-n)(d_M-d_A)$ in (7) reduces to $(\rho-n)(d_M-d_A)$ under the rules outcome, and thus does not depend on unanticipated or on actual inflation, so that this term and thus the distribution of assets (as measured by d_M-d_A) does not affect the optimal outcome.
4. The classification of countries into democracies, viz. countries with regular general elections and a choice of at least two political parties, and non-democracies is the same as in Alesina and Rodrik (1994). Unfortunately, no distribution data were available on a comparative basis for the democratic countries Belgium, Greece and Switzerland.
5. If the quintile in which the median income falls earns a percentage x of total income and all members of the quintile earn the same income, this measure of inequality can be proxied by $M = 1-(x/20)$. This measure is the one that is closest to the measure used in Section 3, (d_A-d_M).
6. A note with statistical detail is available upon request from the authors.
7. This theory supposes that all countries are forced to pursue discretionary monetary policies. However, during the eighties some countries made deliberate attempts to shift from discretion to rules. The tests presented in Table 2 ignore the effects of these attempts. This may not be too bad, since if these effects were present they would only affect the last few years of the sample. In any case, it is doubtful whether central banks can commit to rules. Countries with a fairly equal income distribution such as the Netherlands elect a policy of low inflation. Such a discretionary policy may from an empirical point of view be indistinguishable from the rules outcome.
8. Equation (12) suggests that there is also a public finance argument for this proposition which says that a greater need for government funds $(k \equiv g+(\rho-n)d_A)$ requires more government revenues (including seigniorage) and thus a higher inflation rate (e.g., Mankiw, 1987). This factor is unimportant if debt service is a small fraction of total government spending.
9. Probably, this effect is more important for the Latin-American (formerly) non-democratic countries with extremely high inflation. Earlier empirical work by Blinder and Esaki (1978) on postwar U.S. data finds only minor and insignificant effects of inflation on the income distribution, while work by, for example, Bach and Stephenson (1974) suggests that the highest income earners are most adversely affected by an increase in inflation.

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Appendix: Non-indexed debt and incomplete wage indexation

This appendix extends the model in the main text to allow for incomplete wage indexation (cf. van der Ploeg, 1991). Both nominal debt contracts and nominal wage contracts create incentives for unanticipated inflation. An unexpected increase in inflation reduces the real wage rate, which boosts employment and aggregate supply.

Assume that the output effects of unexpected inflation are equally distributed across households. An individual household's pre-tax income is now given by

$$Y = Q[1 + \theta(\pi - \pi^e) - \tfrac{1}{2}\kappa_1 t^2 - \tfrac{1}{2}\kappa_2(\pi + \rho)^2],\ \kappa_1,\ \kappa_2 \geq 0, \tag{A.1}$$

where $\theta > 0$ measures the degree of wage indexation. Unanticipated inflation is highly effective in raising output if indexation is far from complete (i.e., θ is high). The selected tax and money growth rates under discretion are, respectively,

$$t^D = [\kappa_1 m(m + d_A) + \kappa_2]^{-1}\{\kappa_2 k + [\kappa_2(\rho - n) - \theta - (d_A - d_M)]m\} < t^R \tag{A.2}$$

$$\begin{aligned} \mu^D = \ & [\kappa_1 m(m + d_A) + \kappa_2]^{-1}[\kappa_1(m + d_A)k - \kappa_2(\rho - n) + \theta \\ & +(d_A - d_M)] > \mu^R. \end{aligned} \tag{A.3}$$

Incomplete wage indexation constitutes an independent motive for unanticipated inflation. This implies an additional increase in the equilibrium money growth rate and, hence, an even stronger inflation bias. In equilibrium, however, the higher inflation rate is anticipated so that neither the distribution of wealth not output is affected.

Now, suppose that households no longer differ in terms of nominal debt holdings, but instead differ in their income from production. More specifically, assume that

$$Y_i = Q_i[1 + \theta(\pi - \pi^e) - \tfrac{1}{2}\kappa_1 t^2 - \tfrac{1}{2}\kappa_2(\pi + \rho)^2],\ \kappa_1, \kappa_2 \geq 0, \tag{A.1$'$}$$

so that unanticipated inflation affects households in proportion to their income. In this case, unanticipated inflation has no redistributive effects and it easy to show that the policy mix chosen by a government which represents the median income earner is independent of the relevant degree of inequality, which is now given by the ratio of median and mean income, Q_M/Q_A.