Concerning Kuznets Curves, Persistent Inequality, Inflation, and Redistribution

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Abstract

In this paper we examine the dynamics of the link between inequality and inflation from a political economy perspective. We consider a series of simple dynamic general equilibrium models in which agents vote over the desired inflation rate in each period, and inequality is persistent. Inflation in our models is a mechanism of redistribution, and we find that the link between inequality and inflation within any period or over time depends on institutional and preference related parameters. Furthermore, we find that differences in the initial distributions of wealth can yield a diverse set of patterns for the evolution of the inflation and inequality link.

1. Introduction

The evolution of inequality and its impact on aggregate outcomes of an economy is the subject of various strands of past and contemporary economic research. The nature of how inequality changes over time, and its economic impact, is however, still a matter of some controversy. (See, for example, the survey by Zweimuller 2000). A subset of this literature that is of interest from the point of view of this paper relates to the political economy implications of inequality. Specifically, we are interested in the link between inequality and inflation, viewed from a political economy perspective.

Political economy models that examine the link between inequality and inflation are motivated, in part, by the literature on central bank independence, in which there is support for the view that countries with more independent central banks tend to have favourable inflation outcomes. A theoretical rationale for this link is based on the idea that, in the presence of inequality, there is likely to be a greater degree of political pressure exerted on monetary authorities to use inflation as a re-distributive mechanism. For example, Dolmas, Huffman, and Wynne (2000) document empirical evidence that suggests a positive correlation between inflation and inequality; their model rationalizes this correlation as the desire of economic agents for income redistribution via the inflation-tax. Albanesi (2000) also presents evidence of a positive correlation. The theoretical reason provided in her paper differs from the one presented in Dolmas et. al.: the poor are more vulnerable to inflation than the rich, and consequently are the weaker party in the political process that determines the inflation rate. Bhattacharya et.al. (2005), however, conclude that the relationship between inflation and inequality is non-monotonic; at low levels of inequality the reliance on inflation increases with inequality, but beyond a certain threshold, the correlation becomes negative. They present cross-country evidence that supports this hypothesis, which is the result of recognizing the ability of richer agents to invest in assets that shield them from inflation.

The aim of this paper is to explore the *dynamic* implications of the inflation-inequality link. We consider a series of simple dynamic general equilibrium models in which agents vote over the desired inflation rate in each period, and inequality is persistent. These models are variants of some of the static political economy models discussed above, viz Dolmas et. al. and Bhattacharya et al., with intergenerational bequests introduced as a mechanism of persistence in inequality. A priori, depending on initial conditions, and the environment in question, there are several possibilities for the evolution and inequality link, which we will briefly discuss below. These possibilities arise particularly in the case where the static link between inflation and inequality is non-monotonic and stem from an interesting feature of these models: viz., the evolution of inequality in these models is endogenous. That is, a given level of inequality influences the desired inflation rate, which in turn determines the inequality of the wealth distribution in the subsequent period, which impacts on the next period inflation rate, and so on.

One of the motivations underlying this exploration is based purely on theoretical speculation, and stems, in part, from extant as well as historical views regarding the evolution of inequality. Early literature on the trends in income and wealth distributions unearthed the well known *Kuznets Curve* – i.e. inequality initially increased and then decreased over time (or as development progressed) exhibiting an inverted-U shaped pattern. More recent evidence, on the other hand, suggests that inequality may be more persistent than it was earlier believed to be- in some cases the pattern may reverse, showing instead a U-shaped pattern in inequality over time[1]. Ignoring for the moment that inequality may be endogenously determined by inflation, it would be of interest to examine the political economy implications of trends in inequality for the trends in inflation. For example, if there is a Kuznets curve, and we believe that inequality positively impacts on inflation, then, *cetirus paribus*, would one expect to see an inverted-U shaped pattern for inflation? While it is highly unlikely that a long run pattern of this type would exist, given that inflation is affected by many other factors other than inequality, the question is, nevertheless, interesting *per se* from a purely theoretical perspective.

Taking into account the impact of inflation on inequality, we may also speculate on a political economy rationale for the Kuznets curve.[2] For example, in the presence of persistent inequality generated via intergenerational linkages, initial increases may lead to higher inflation, which could either reduce inequality through the redistributive process, or bring down the rate of increase in inequality. In the latter case, further increases in inflation would eventually reduce inequality, leading to subsequent reductions in inflation due to politico-economic reasons. One can also

[1] For a historical survey of the changing significance of Kuznets's hypothesis see Moran (2005).
[2] We emphasize that this speculation is not based on the belief that the Kuznets Curve is a stylized fact; rather we are interested in deriving potential politico-economic reasons for the emergence of such a relationship, *if* it exists.

speculate on the possibility of cycles in which the pattern initially appears to exhibit a Kuznets curve, and then reverses itself – this may arise in situations where the static link between inflation and inequality is non-monotonic. This has in fact been the experience in regards to the Kuznets hypothesis – researchers have found that the pattern either reverses itself or disappears.

Secondly, empirical evidence on the experience of some Latin-American countries shows episodes of co-movement in inequality and inflation in annual data on average inflation and the Gini coefficient of income. (See Bittencourt 2005, figure 3, page 11). This motivates an interest in the possibility of fluctuations induced in inflation and inequality that are purely a part of the political process of the economy, i.e, whether there are politically induced limit cycles of the type that have been studied, for example in Huffman(1996, 1997). Furthermore, it would also be interesting to examine how the transitional dynamics of our models would be impacted on by other mechanisms of redistribution, such as taxation, or other institutional characteristics, such as the cost of adopting technology/assets that shield agents from inflation.

In order to address these issues, we consider dynamic extensions of some political economy models in the literature with persistence in inequality introduced via the mechanism of intergenerational altruism. Inflation in our models is a mechanism of redistribution, and we find that the link between inequality and inflation within any period or over time depends on institutional and preference related parameters. Furthermore, we find that differences in the initial distributions of wealth can yield a diverse set of patterns for the evolution of the inflation and inequality link. In some cases there appear to be limit cycles; the pattern for inequality resembles a series of *Kuznets curves* – i.e, inequality increases and then decreases over time, and this pattern appears to repeat itself. Interestingly, in some cases, the corresponding pattern for inflation may also be very similar. In other cases, inequality initially appears to follow a Kuznets curve type of pattern, and then increases again; the corresponding pattern for inflation is similar. The model also provides a political economy rationale for why the patterns of inequality can reverse over time. An implication of this feature of the model is that, depending on the data set in question, one can find either a U shaped or inverted-U shaped relationship for the dynamics of inequality, thus providing a political economy rationale for appearance and disappearance of Kuznets-Curve type phenomena.

Subsequent sections of this paper are organized as follows. In Sections 2 and 3, we present simple extensions of some static political economy models in the literature, modified to include some mechanisms that allow for persistence in inequality, which in turn also enable a meaningful dynamic analysis of such models. We also include income and wealth taxation, but abstract from political economy determination of these mechanisms in order to simplify our analysis. In Section 4 we present an analysis of the results based on numerical simulations of our models. Section 5 concludes.

2. Model 1

We consider an overlapping-generations economy in which agents live for two periods, with a new generation born in every period. Time is discrete and indexed by t= 1, 2, 3,…. An agent born in period t has an endowment y_t of the consumption good when young. This endowment, which we will refer to as income, is heterogeneous across agents, and is determined by the probability distribution $F(.)$. The agent also receives a bequest w_t from the previous generation, which supplements the agent's first period income endowment. The endowment y_t and the bequest w_t are the source of inequality in the model.

An agent's preferences are described by the following lifetime utility function:

$$U(c_t, c_{t+1}, b_{t+1}) = \ln(c_t) + \beta \ln(c_{t+1}) + \beta\theta \ln(b_{t+1}). \quad (1)$$

Here c_t and c_{t+1} refer to the consumption in periods t and t+1 of an agent born in period t. The agent also leaves a bequest b_{t+1} for the next generation. The parameter β is the subjective discount factor, while θ is a parameter representing the extent of intergenerational altruism in the model. The agent's budget constraints in the two periods of their lives take the following form:

$$c_t = (1-\tau)(y_t + w_t) - m_t + TR_t \quad (2)$$

$$c_{t+1} = R_{mt} m_t - b_{t+1} + TRM_t. \quad (3)$$

In equations (2) and (3) m_t represents saving in the form of fiat money undertaken when the agent is young. Agents are also subject to a tax on their income and wealth endowments when young, which is denoted by τ. The variables

$TR = \tau \int_{y_{\min}}^{y_{\max}} yF(dy) + \tau \int_{w_{\min}}^{w_{\max}} wG(dw) = \tau\left(\bar{y} + \bar{w}\right)$ and TRM are lump-sum transfers based on tax revenue and seigniorage respectively. The variable R_{mt} represents the return on money, and is also equal to $\frac{1}{1+\pi}$, where π is the rate of inflation.

This model can be regarded as a straightforward extension of the framework studied in Dolmas et. al.(2000), which is nested here as the special case in which $\beta = 1, \theta = 0, \tau = 0$. Agents maximize (1) subject to (2) and (3), and it is easy to show that the agent's "saving function" is given by:

$$m_t = \frac{1+\beta\theta}{2+\beta\theta}\left[(1-\tau)(y_t + w_t) + \tau(\bar{y}_t + \bar{w}_t)\right] - \left(\frac{1}{2+\beta\theta}\right)\frac{TRM_t}{R_{mt}}.$$

However, we need to specify how *TRM* is determined, which is indirectly determined by the government policy with respect to inflation. In common with Dolmas et. al. we assume that in each period t, the young agents vote on the desired inflation rate prior to their consumption and savings decision[3]. Furthermore, as in Dolmas et. al., we can show that $TRM_t = (1 - R_{mt})\bar{m}_t$. Using the saving function above, we can solve for the lump sum seignorage based transfer:

$$TRM_t = \frac{R_{mt}(1-R_{mt})(1+\beta\theta)(\bar{y}_t + \bar{w}_t)}{1 + R_{mt}(1+\beta\theta)}. \tag{4}$$

The agent's indirect utility function can then be written as:

$$\begin{aligned} &V(R_{mt};\tau, y_t, \bar{y}_t, w_t, \bar{w}_t) \\ &= (1+\beta+\beta\theta)\ln\left[(1-\tau)(y_t + w_t) + \left\{\tau + \frac{(1-R_{mt})(1+\beta\theta)}{1+R_{mt}(1+\beta\theta)}\right\}(\bar{y}_t + \bar{w}_t)\right] \\ &\qquad + \beta(1+\theta)\ln(R_{mt}) + \beta\ln(\beta) + \beta\theta\ln(\beta\theta). \end{aligned} \tag{5}$$

Note that the agent's utility is positively related to the average income and wealth of her cohort, as this directly impacts on the amount of seigniorage transfer received. We can also rewrite the above function as positively related to $\nu_t = (\bar{y}_t + \bar{w}_t)/(y_t + w_t)$, which characterizes the extent of inequality in the economy, where $y_t + w_t$ represents the income and wealth endowment of the median voter. In Section 4 we will analyse the link between the parameter ν_t and the optimal inflation

[3] For the justification of the assumption regarding timing, and that only the young vote, see Dolmas et. al. (2000)and Bhattacharya et al. (2005).

rate. The optimal rate of inflation, or alternatively the optimal R_m, is the value which maximizes the indirect utility function above. Since we cannot solve for R_m^* analytically, our numerical procedure involves searching for the value of R_m that maximizes the function over a grid of 500 points in the interval (0, 1].

To simplify the dynamic analysis of the model, we assume that the distribution of income is fixed. However, the distribution of wealth is allowed to change over time, and is characterized by the bequest function, which is given by

$$b_{t+1}^* = \frac{\beta\theta R_{mt}}{2+\beta\theta}\left[(1-\tau)(y_t + w_t) + \left\{\tau + \frac{(1-R_{mt})(1+\beta\theta)}{1+R_{mt}(1+\beta\theta)}\right\}(\bar{y}_t + \bar{w}_t)\right].$$

Note that $w_t = b_t$ and $\bar{w}_t = \bar{b}_t$. It is then obvious that in this model inequality is not likely to be very persistent as the level of bequests will converge to a steady state, given the nature of the above function. While it is still of interest to examine the steady state levels of inflation and inequality in the model, and how they are impacted on by some of the parameters of the model, we will analyse these results (in section 4) with a view towards developing intuition for the results of model developed in the next section, which is essentially an extension of the model presented here.

3. Model 2

In this model we allow for the existence of another asset in addition to fiat money and we further assume that the returns to holding this asset are not affected by inflation. As in Bhattacharya et. al., we refer to this asset as a “storage” technology, which is associated with a fixed cost δ. In equilibrium, for a sufficiently large δ, it is then possible that some agents will hold money, while the remainder hold the storage technology.

Preferences of agents in this model are similar to that of the agents in model 1. However, we use superscripts “m” and “s” to distinguish between agents holding money and those holding storage respectively. The budget constraints applying to agents holding storage are then given by:

$$c_t^s = (1-\tau)(y_t + w_t) - s_t + TR_t - \delta \qquad (6)$$

$$c_{t+1}^s = xs_t - b_{t+1}^s + TRM_t. \qquad (7)$$

The budget constraints of agents holding money are identical to equations (2) and (3), with appropriate superscripts on the variables. As in the model described in the previous section young agents in each period t vote on the desired R_m.[4] The seigniorage based transfer is now given by

$$TRM_t = \frac{R_{mt}(1-R_{mt})(1+\beta)}{(2+\beta\theta)R_{mt}+1-R_{mt}}\left[(1-\tau)(\bar{\bar{y}}_t+\bar{\bar{w}}_t)+\tau(\bar{y}_t+\bar{w}_t)\right]. \qquad (8)$$

Here $\bar{\bar{y}}$ and $\bar{\bar{w}}$ represent the average income and wealth levels of the sub-cohort of agents holding only money, while $\bar{y}$ and $\bar{w}$ represent corresponding income and wealth means for the entire generation of agents. The decision to hold storage is based on a comparison of indirect utilities from holding storage and money. We can then derive the following result.

Proposition 1: Let $\lambda = \left(\frac{R_{mt}}{x}\right)^{\frac{\beta(1+\theta)}{1+\beta(1+\theta)}}$, and TRM_t be described by equation (8). Agents hold the storage technology *iff*

$$y_t + w_t \geq \frac{\delta - \frac{TRM_t}{x} + \lambda\frac{TRM_t}{R_{mt}} + (\lambda-1)\tau(\bar{y}_t+\bar{w}_t)}{(1-\tau)(1-\lambda)}.$$

Let $\hat{z} = \hat{y} + \hat{w}$ denote the critical level of income plus wealth for which the agents switch to storage. Note that the critical level of income and wealth above which agents choose to hold the storage technology depends on various parameters of the model in interesting ways. This critical level is increasing in the fixed cost parameter δ and the parameter λ, and the underlying intuition is fairly obvious. It is also clear that the tax parameter τ will be of some significance to the equilibrium outcomes of this model.

The determination of equilibrium this model is however somewhat complicated. Given R_{mt} and the critical level of income and wealth, $\hat{z}$, for which agents choose the storage technology, one can determine TRM_t. However TRM_t as defined by Proposition 1 above determines $\hat{z}$. Our numerical procedure therefore essentially involves looking for a fixed point: For each value of R_{mt} in a grid of 1000 points in (0,1], we make an initial guess for the corresponding $\hat{z}$, and then compute TRM_t. We then update our guess for $\hat{z}$. The procedure is repeated until convergence is

[4] In this respect our model differs from that of Bhattrachrya et. al., who assume that agents vote on the proportion of revenue that is raised via seigniorage. Furthermore, government spending in their model is “purposeless”, and agents pay a lump sum tax.

achieved. To compute the optimal inflation rate, we again compare utilities for each agent for different R_{mt}. We then add up the "votes" for each R_{mt}, and the winner is decided using the plurality rule.[5]

We now turn to a brief discussion of the dynamics of this model. Somewhat heuristically, the presence of a fixed cost introduces a "non-convexity" in this model, which ensures that inequality will be more persistent. (See Piketty 2000, for a discussion of relevant literature). Again, to simplify the dynamics, we assume that the distribution of income is fixed across generation, so that the dynamics of the model essentially depends on the evolution of bequests. However, the bequest function for an agent in this model may be truncated; for income plus wealth less than $\hat{z}$ she would hold money, while for income greater than $\hat{z}$ she would hold storage. The optimal bequest functions for the two cases are given by:

$$b_{t+1}^{m*} = \frac{\theta\beta R_{mt}}{2+\beta\theta}\left[(1-\tau)z_t + \frac{TRM_t}{R_{mt}} + \tau\overline{z}_t\right]; \qquad z_t < \hat{z}_t$$

$$b_{t+1}^{s*} = \frac{\theta\beta x}{2+\beta\theta}\left[(1-\tau)z_t + \frac{TRM_t}{x} + \tau\overline{z}_t\right]; \qquad z_t \geq \hat{z}_t .$$

This truncation allows for the possibility of divergence in the bequest levels in the presence of inequality. Also, our numerical simulations of this model, presented in the next section illustrate the possibility of cycles in inflation and inequality.

4. Results Based on Numerical Experiments

In what follows we discuss the results based on some quantitative experiments using Model 1 and 2 of the paper, presented in sections 4.1 and 4.2 respectively. In each case we first analyse the static relationship between inflation and inequality in any given period, and then examine the dynamic implications of the model.

4.1. Experiments Based on Model 1

In Figure 1, we present the optimal R_{mt} for different values of the inequality parameter $\nu = \dfrac{\overline{y}+\overline{w}}{y+w} = \dfrac{\overline{z}}{z}$ discussed in Section 2 in the case of model. Figure 1 also

[5] Note that results do not differ if we use the majority rule. In all of our simulation the winning alternative got more than 50% of the vote.

examines this relationship for different values of the altruism parameter θ. Higher values of the parameter ν represent a higher level of mean income+wealth relative to the median level of income +wealth, and consequently characterize a greater degree of inequality. Figure 1 clearly illustrates that the optimal return on money is decreasing in this parameter. This in turn implies that higher levels of inequality are associated with higher levels of inflation; this was also the case in the benchmark model by Dolmas et. al. (2000). The intuition underlying the result is straightforward: inflation is a mechanism of redistribution in this model, greater inequality involves a greater desire for redistribution via the seigniorage transfer, and consequently a higher rate of inflation. However, it is interesting to note that the incorporation of intergenerational altruism strengthens this relationship in a quantitative sense; for a given level of inequality a higher value of the altruism parameter is associated with a higher level of inflation. A higher value of θ implies that the agent wishes to leave more bequests for the next generation – this is made possible if there is greater redistribution via the seiginiorage based transfer.

Next we consider the implication of the tax parameter τ for the inflation-inequality relationship in the model. To that end, Figure 2 reports a similar experiment as in Figure 1 for different values of the tax rate. The results are as expected – higher taxes lessen the need for redistribution via seigniorage. In the extreme (but obviously counter-factual) case of 100% taxation the inflation and inequality relationship vanishes. The empirical implication, then, is that the inflation-inequality link is likely to be weaker if efficient alternative means of progressive taxation exist. Of course, the obvious caveat is that we have considered an endowment economy in which there are no incentive effects of the type one would expect in more realistic production economies.

We now turn to the dynamic version of Model 1. Figures 3 and 4 present the dynamics of the inequality parameter ν and R_{mt} respectively for different values of the tax rate. The initial distribution of income in these cases is characterized by $\nu = 1.08$. The intuition underlying these results is fairly obvious and analogous to those obtained in the static case, and does not require further elaboration. The same comment applies to similar experiments involving the altruism parameter θ, which are presented in Figures 5 and 6. In a nutshell low tax rates are associated with high inflation and inequality outcomes in the steady state, while, in contrast a feature of the θ experiments is that in the long run smaller values of theta imply relatively high inequality combined with relatively low inflation outcome.[6]

4.2. Experiments Based on Model 2

We now turn to the discussion of numerical simulations using the model discussed in Section 3. The static initial period relationship between inequality, as characterized by the Gini coefficient of the income and wealth distribution, and the desired value of R_{mt}, is presented in Figure 7. One possible interpretation for this Figure is as follows. For low levels of inequality there appears to be a positive link. As inequality increases in this range it is possible that there is a switch to holding money, which increases the inflation-tax base. However, the income and wealth tax related transfer also increases, enabling more people to hold storage. Therefore it is possible that the percentage of people holding money first increases and then decreases – numerical simulations corresponding to distributions used in Figure 7 confirm that this is indeed the case. Furthermore the model also has a Laffer curve associated with seigniorage revenue. Since inflation also erodes the return to saving high inflation rates tend to decrease the tax base as people switch to holding the storage technology. Both storage holders and money holders in this model receive the seigniorage transfer and are therefore likely to vote for the inflation rate that optimizes this transfer. For a fairly large range of inequality the optimal inflation rate initially increases as the number of people holding money increases, and then starts to decrease as the number of people holding money start switching to storage.

At a very high level of inequality the extent of redistribution via income and wealth taxes makes it possible for most agents to switch, and there is sudden jump in the optimal inflation rate as evidenced in Figure 7. Why this jump occurs is difficult to explain intuitively, and is probably an artefact of the non-convexity in this model. It is interesting to note that this jump occurs due to the presence of progressive taxation. With $\tau = 0$, the relationship between inflation and inequality is somewhat similar to what is observed in the Bhattacharya et. al. model. The presence of taxation consequently has interesting implications for the dynamics of the model.

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[6] Note that the results are not particularly sensitive to variations in the initial distribution of income and wealth. Results however are available upon request.

We now turn to the analysis of the dynamics of this model. It turns out that depending on initial conditions, there are myriad possibilities for the evolution of inflation and inequality in this framework. Figure 8(a) presents the case in which the initial income + wealth distribution is described by a Gini coefficient equal to 0.35.[7] We also assume in this case the following values of parameters: $\theta = 1; \beta = 1; \delta = 80$. The four panels in this figure represent the evolution over time of the Gini coefficient, the percentage of people holding money, the elected inflation rate, and the percentage of agents voting in favour of the elected rate. The solid line represents the case in which the tax parameter τ is set equal to 0.3, and the solid line represents the case in which $\tau = 0.5$.

We first look at the $\tau = 0.3$ case in Figure 8(a). Here fluctuations in the inflation move with fluctuations in inequality as characterized by the Gini coefficient of income + wealth in the economy. Increasing inequality appears to increase inflation, leading to decreases in the next period's inequality via redistribution. The decrease in inequality then leads to lower inflation rate, which seems to increase inequality in the next period. The correlation between inflation and inequality is positive and approximately =0.68. However, the fluctuations in inflation are more dramatic. The large jumps in the inflation rate appear to coincide with the percentage of agents holding money, but the pattern is not unambiguous – there is a time horizon over which inflation fluctuates, but the seigniorage tax base declines steadily.

Looking at the $\tau = 0.5$ case we find an entirely different pattern in the models inequality-inflation path. The correlation between the model's time series on inflation and inequality is now negative and approximately equal to -0.33. However, both the levels of inequality and inflation are much lower, as the alternative form of redistribution is considerably more progressive. In contrast to the $\tau = 0.3$ case the increases in the seigniorage base is now associated with declines in the inflation rate.

In Figure 8(b) we attempt to explore the dynamics of the Laffer curves – i.e the lump-sum seigniorage based transfer TRM as a function of R_m, corresponding to various time periods. The peaks corresponding to the $\tau = 0.3$ case move to the left over time, indicating high levels of the optimal inflation rate. This also happens in the $\tau = 0.5$ case but the shift is smaller.

[7] In all our simulations we use an initial distribution which is lognormal with mean 1.2. All the initial distributions considered in our experiments are mean preserving spreads of this distribution.

Next we consider some experiments that change the fixed cost parameter δ, keeping other parameters as in the case of Figure 8, with $\tau = 0.3$. Figures 9(a) and 9(b) illustrate the results of this experiment. A sufficiently high fixed cost of holding the storage technology is associated with a steady level of inflation that is close to zero, and a lower level of inequality. Intuitively, this is reasonably clear – there are a large number of people holding money and redistribution is better achieved via a small amount of inflation to supplement income and wealth taxation, given that inflation reduces the return on saving. Low values of the fixed cost imply that a minority of agents hold money, and storage holders simply vote for the inflation rate that maximizes the seigniorage based transfer. Figure 9(c) presents the corresponding dynamic patterns in the evolution of the Laffer curves, and are consistent with the results presented in 9(a) and (b).

The experiments in Figures 8 and 9 assumed an initial distribution characterized by a Gini coefficient of 0.35. We now turn to experiments that use a different initial distribution, characterized by a Gini coefficient equal to 0.4387. The time horizon considered is also longer since the patterns in this case can change dramatically, after initially seeming to converge to a steady state. Figures 10(a)-10(d) consider the case for which the other parameters are fixed at $\theta = 1; \beta = 1; \delta = 80; \tau = 0.3$. The pattern in Figure 10(a) shows a Kuznets type pattern in inequality for the first 20 periods, which is also mirrored in the pattern for inflation in the first 20 periods – the inflation inequality correlation in this period is 0.7927. Subsequently, the pattern changes dramatically – inequality decreases and inflation increases for about 30 periods. After about 70 periods the model appears to enter equilibrium with cycles in inflation and inequality, with a series of recurring patterns in inequality that resemble a series of Kuznets curves. The overall correlation between inflation and inequality over the entire time horizon considered is negative and equal to -0.6061. As illustrated in Figure 10(c) and Figure 10(d) this is an economy with relatively small number of people holding money, which as illustrated by our previous experiments correlates with high levels of inflation. The fluctuations in the percentage of agents holding money coincides with the jumps in the inflation rate observed in Figure 10(b).

Figures 11(a)-(d) report the corresponding experiments with the fixed cost parameter. For a sufficiently high δ, the percentage of people holding money become part of the majority, thus inducing an immediate convergence to a steady state with low inflation. However, inequality converges rapidly to a steady state which is higher than the one associated with a lower fixed cost.

Figures 12(a)-(d) report the corresponding experiments with the exogenous tax rate. Again, in contrast to the set of experiments with an initial distribution corresponding to a lower Gini coefficient, the higher tax rate corresponds to a steady with a higher level of inflation, even though it reduces inequality to a significantly lower steady state level compared to the lower tax rate.

The above experiments serve to illustrate the dynamic implications of fairly stylized political economy model of inflation and inequality can be very complex. Multiple equilibria are possible, which are very diverse in nature. In particular changes in exogenous institutional parameters or initial conditions can produce very persistent cycles in in inflation and inequality, or lead to high inflation traps. In a sense, these results reinforce the literature in support of central bank independence.

Furthermore, depending on initial conditions, a very diverse set of predictions are possible in relation to the hypothesized inflation and inequality correlation. To that end, results in the extant empirical literature on the inflation and inequality link needs to be interpreted with caution.

5. Concluding Remarks

In this paper we examine the dynamics of the link between inequality and inflation from a political economy perspective. We consider a series of simple dynamic general equilibrium models in which agents vote over the desired inflation rate in each period, and inequality is persistent. Inflation in our models is a mechanism of redistribution, and we find that the link between inequality and inflation in any period depends on institutional features such as the extent of progressive taxation in the economy, or the cost of adopting technologies that shield agents from inflation. We find that differences in the initial distributions of wealth and income can yield a diverse set of patterns for the evolution of the inflation and inequality link. In some cases the pattern for inequality resembles a series of *Kuznets curves* – i.e, inequality increases and then decreases over time, and this pattern appears to repeat itself. Interestingly, in some cases the corresponding pattern for inflation may also be very similar. In other cases, inequality initially appears to follow a Kuznets curve type of pattern, and then increases again; the corresponding pattern for inflation is similar.

The above experiments serve to illustrate the dynamic implications of fairly stylized political economy model of inflation and inequality can be very complex. Multiple equilibria are possible, which are very diverse in nature. In particular changes in exogenous institutional parameters or initial conditions can produce very persistent cycles in inflation and inequality, or lead to high inflation traps. In a sense, these results reinforce the literature in support of central bank independence.

Furthermore, depending on initial conditions, a very diverse set of predictions are possible in relation to the hypothesized inflation and inequality correlation. To that end, results in the extant empirical literature on the inflation and inequality link needs to be interpreted with caution.

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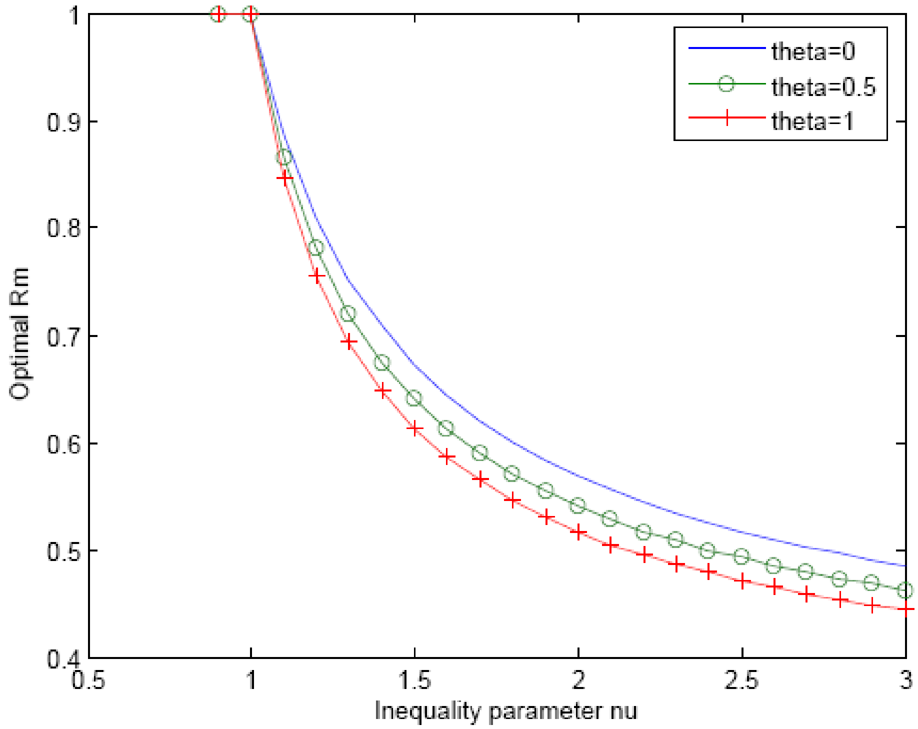

Figure 1: Inequality and inflation in Model 1, τ fixed at 0.3.

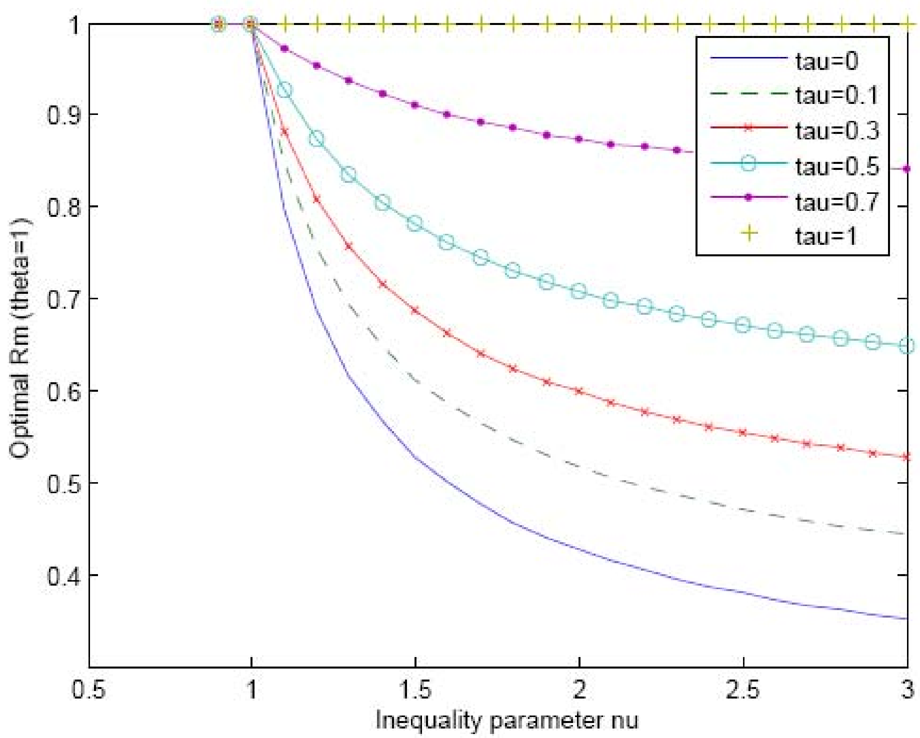

Figure 2 :Inequality and inflation in Model 1, θ fixed at 1.

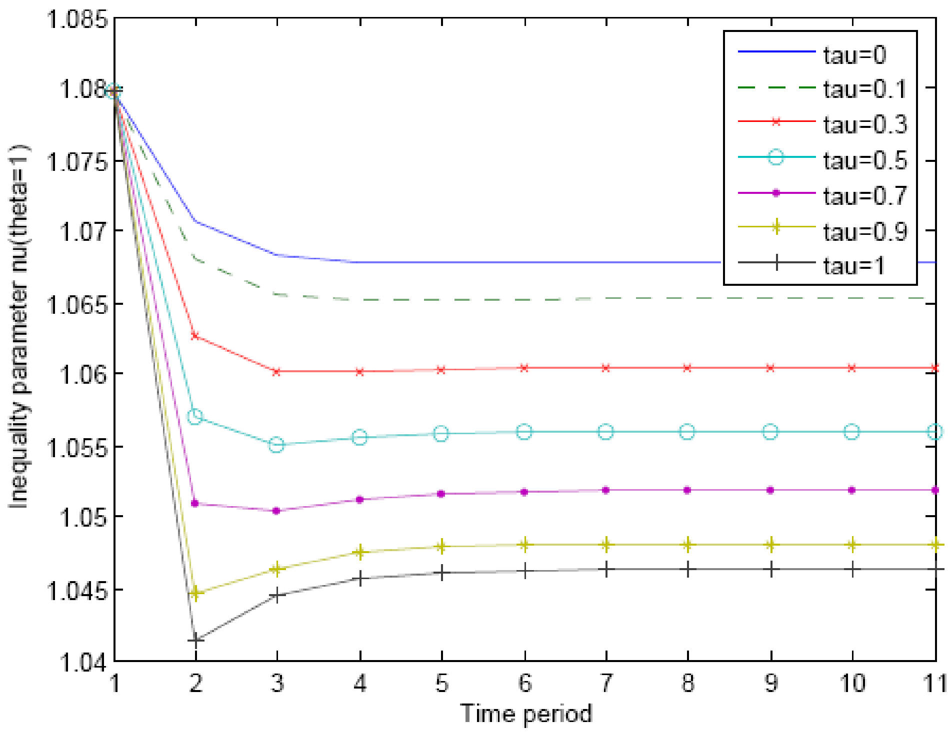

Figure 3 : Dynamics of the inequality parameter, different values of τ .

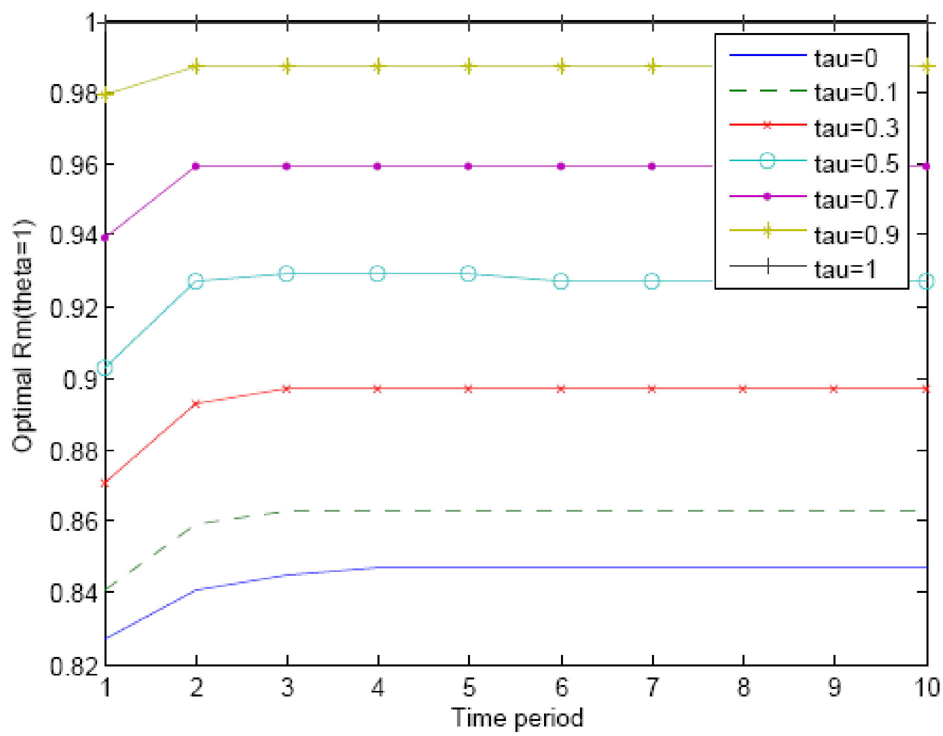

Fig 4: Dynamics for Rm, different values of τ .

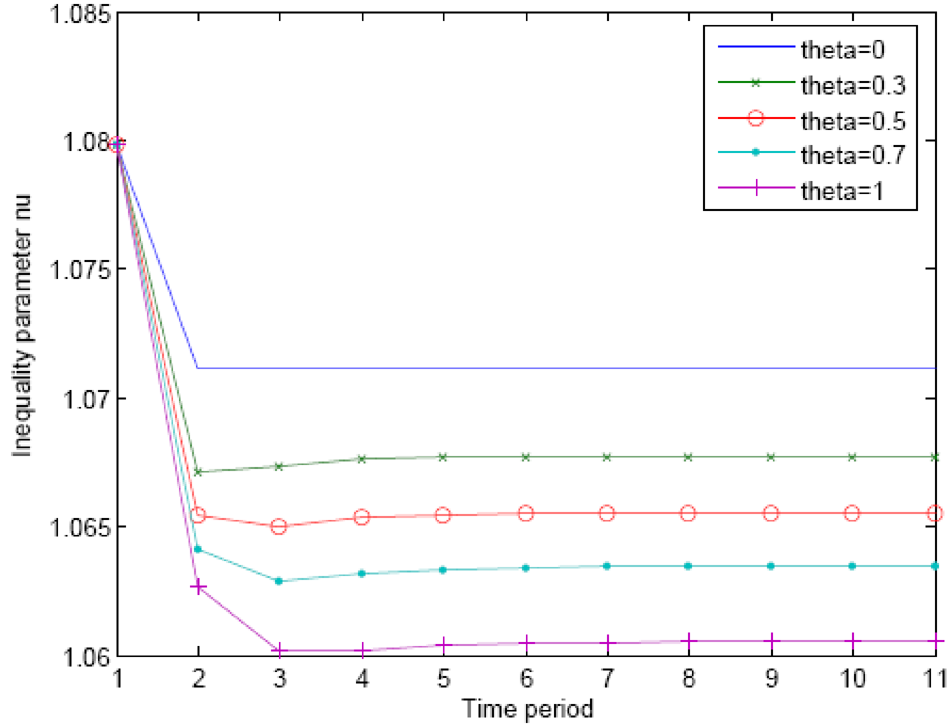

Figure 5: Dynamics of the inequality parameter, different values of θ.

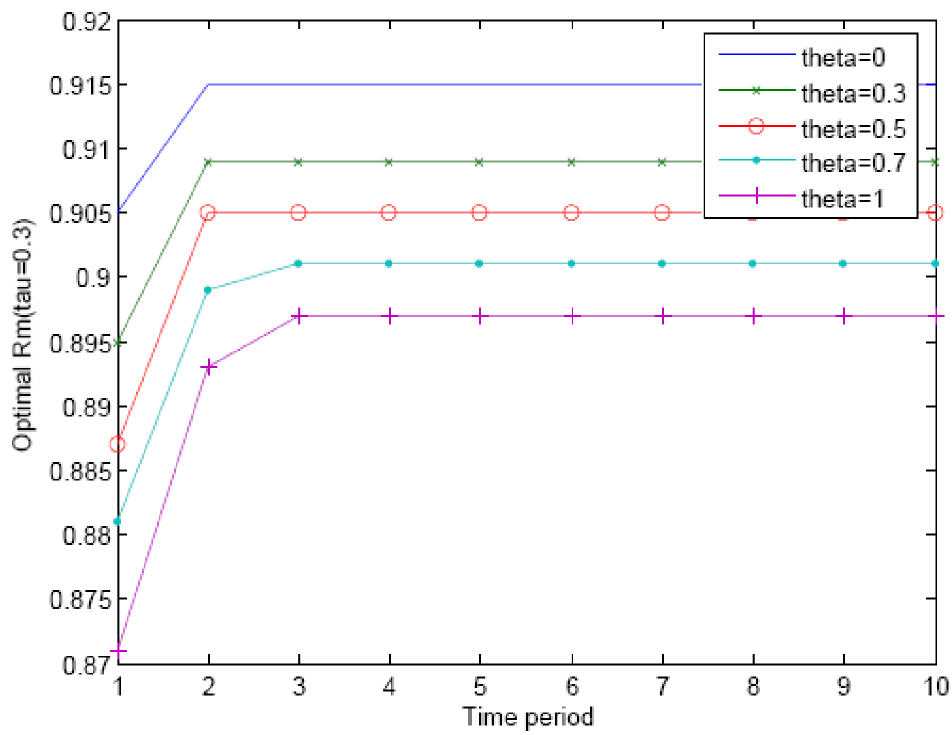

Figure 6: Dynamics of Rm, different values of θ.

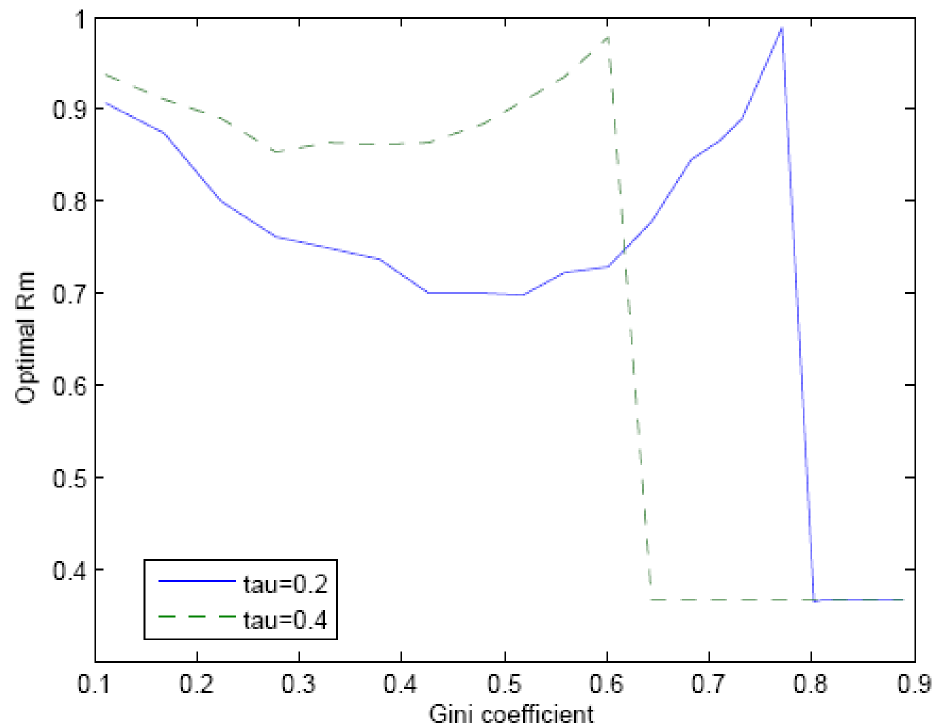

Figure 7: Optimal Rm in Model 2 as inequality increases, $\tau = 0.2$ and $\tau = 0.4$, θ fixed at 1;

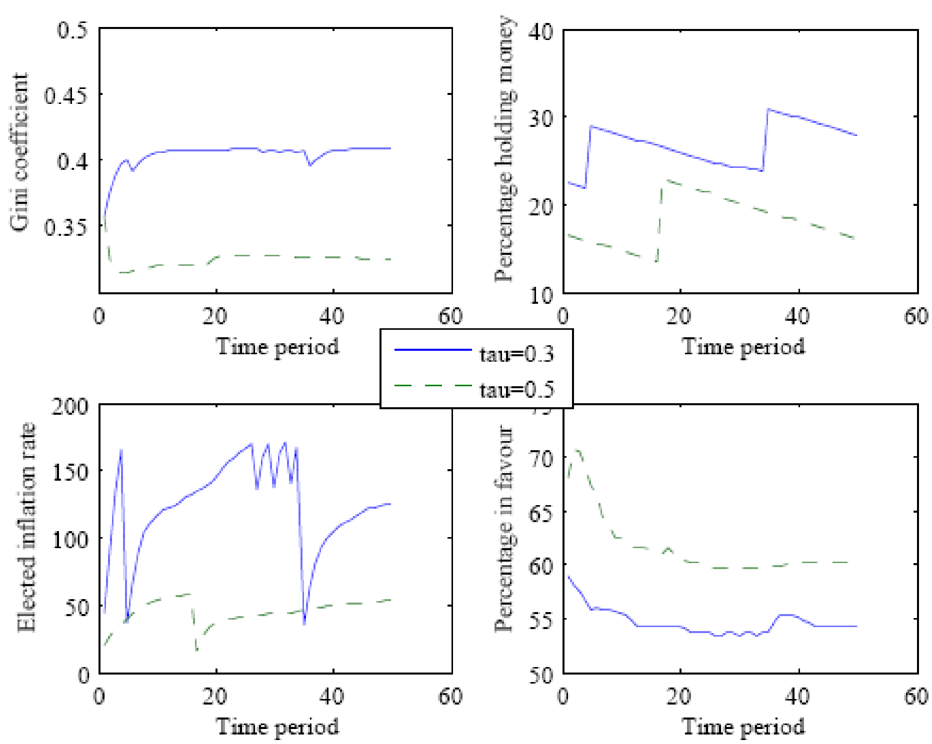

Figure 8(a): Dynamics of Model 2, initial Gini =.35, $\theta = 1$; $\delta = 80$.

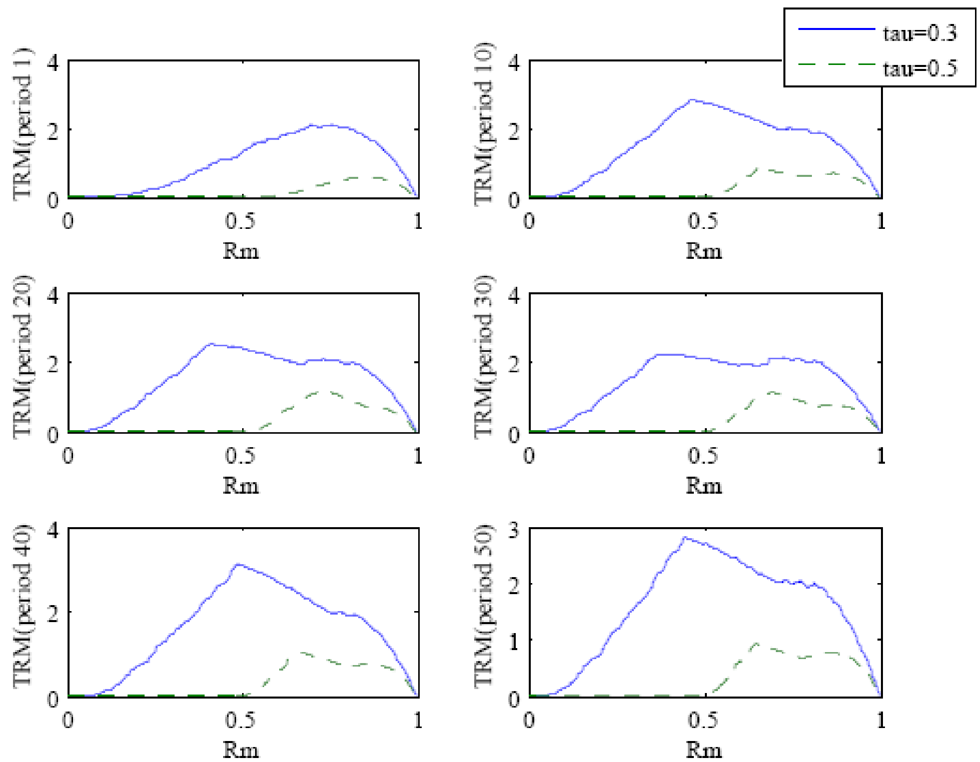

Figure 8(b):Laffer Curves; initial Gini =.35, $\theta = 1$; $\delta = 80$.

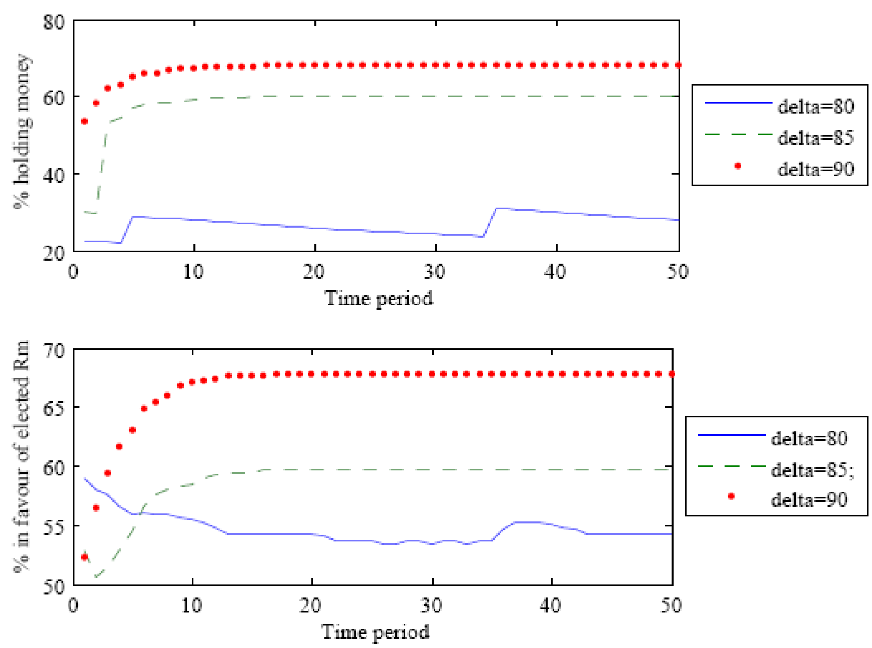

Figure 9(a): Same initial distribution as above, $\tau = 0.3$, experiments with δ.

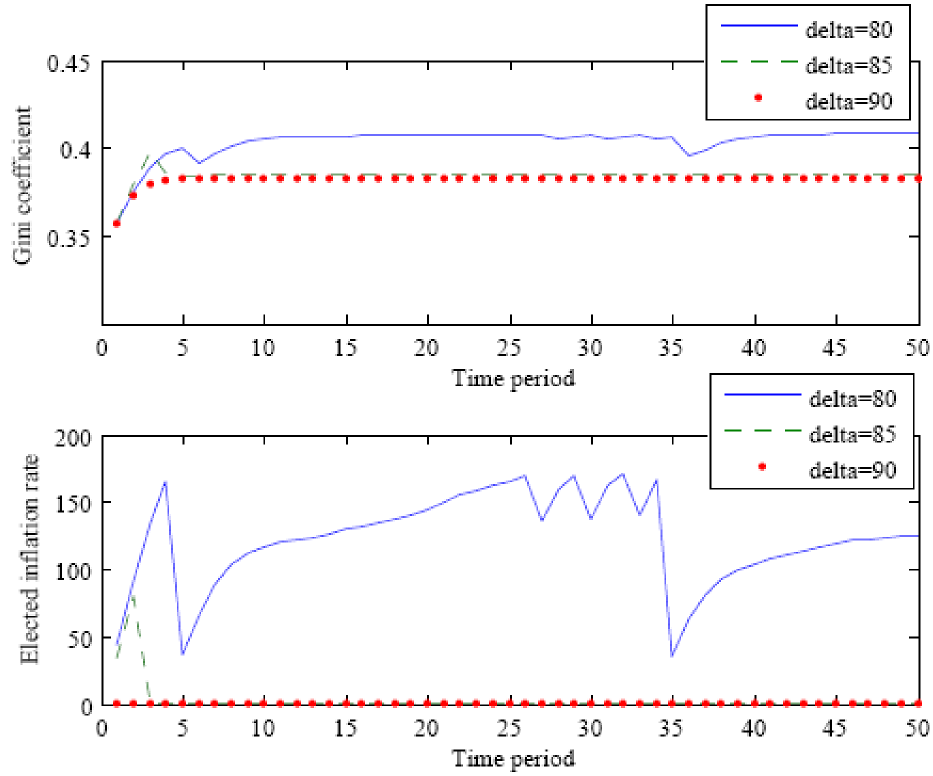

Figure 9(b): Same initial distribution, experiments with δ.

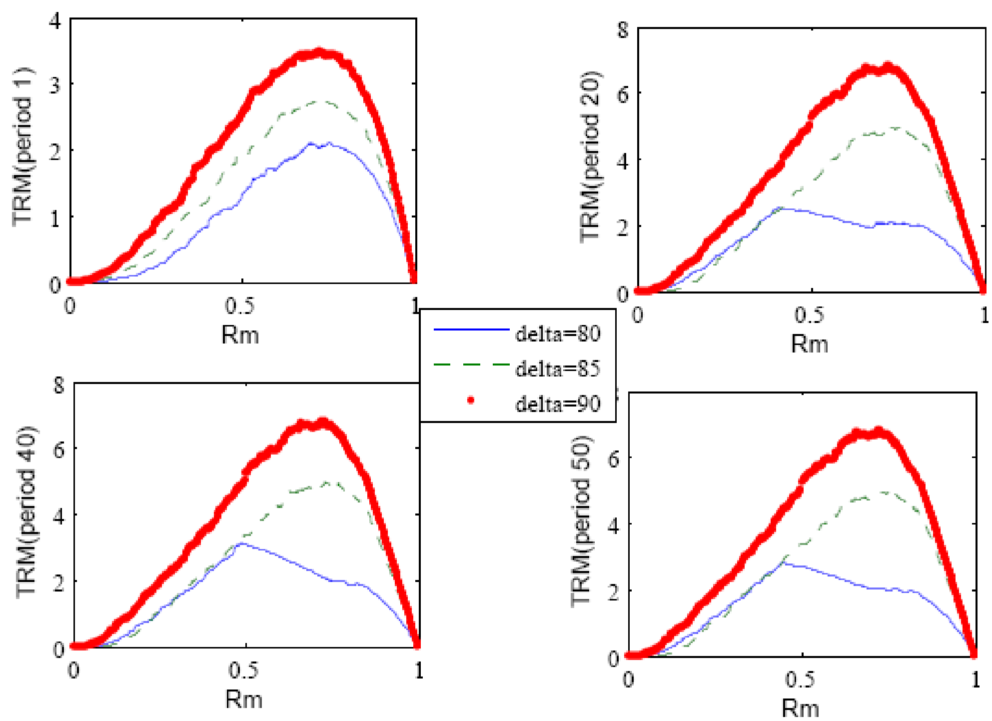

Figure 9(c): Laffer Curves; same initial distribution as above, $\tau = 0.3$, experiments with δ.

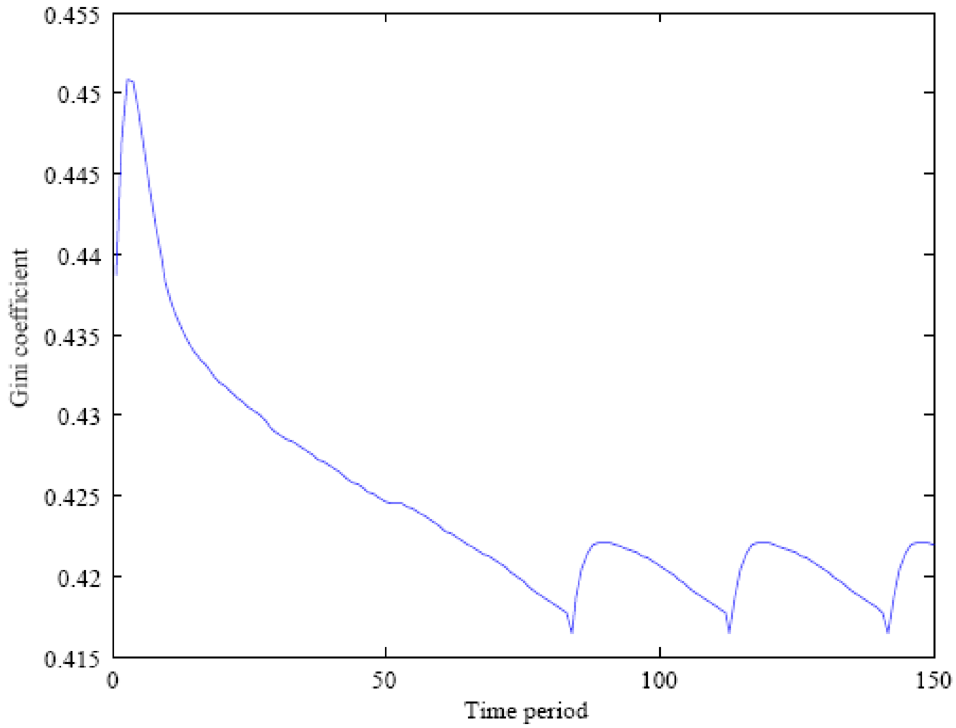

Figure 10(a): Initial Gini=.4387, $\theta = 1$, $\delta = 80$, $\tau = 0.3$.

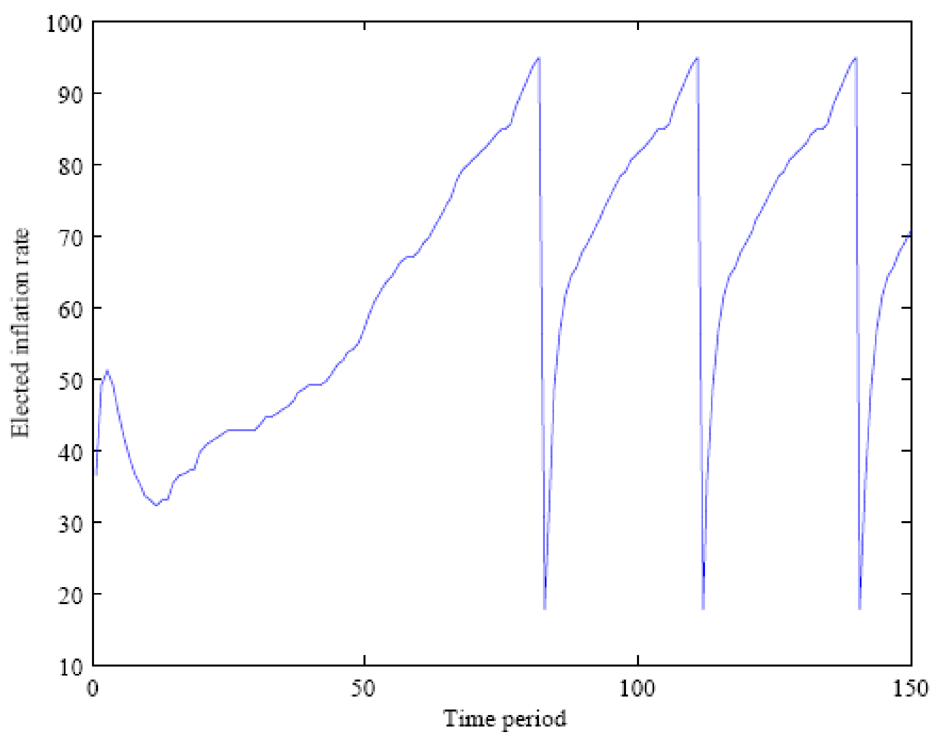

Figure 10(b): Initial Gini=.4387, $\theta = 1$, $\delta = 80$, $\tau = 0.3$.

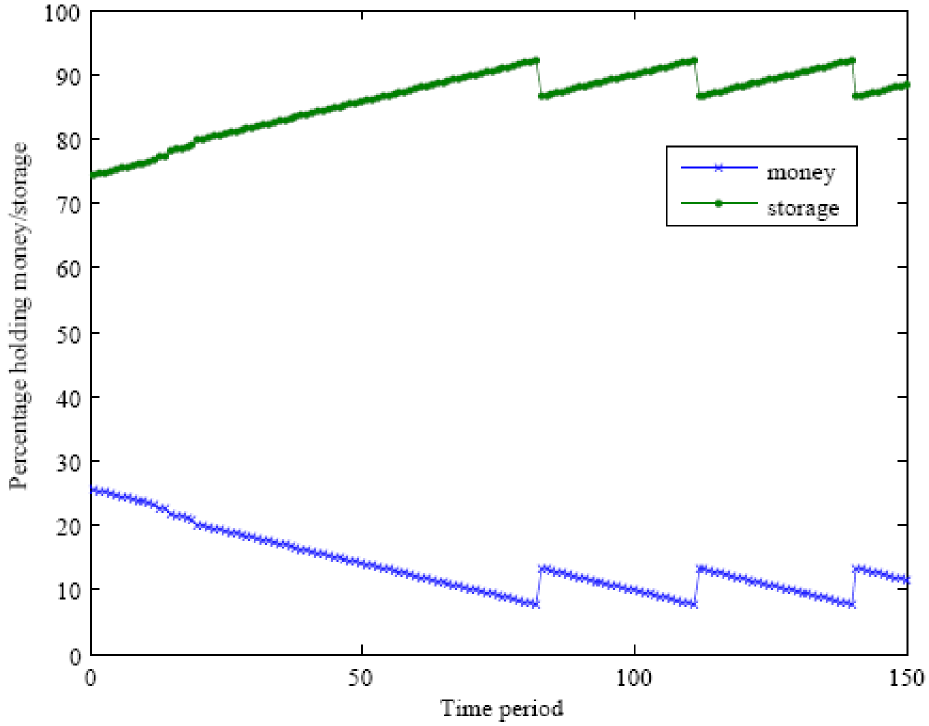

Figure 10(c).

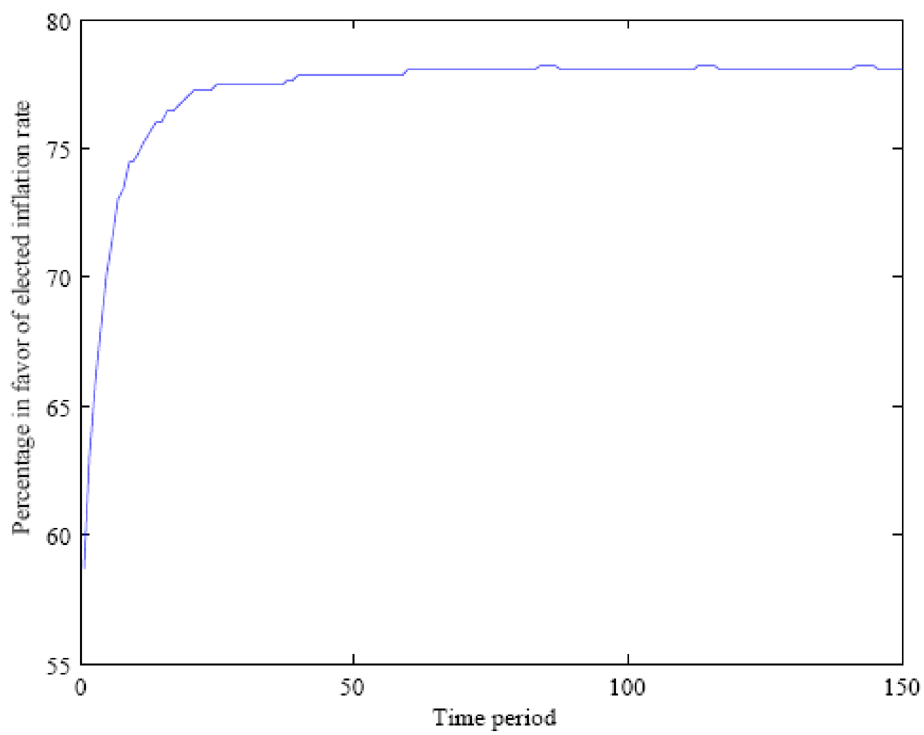

Figure 10(d)

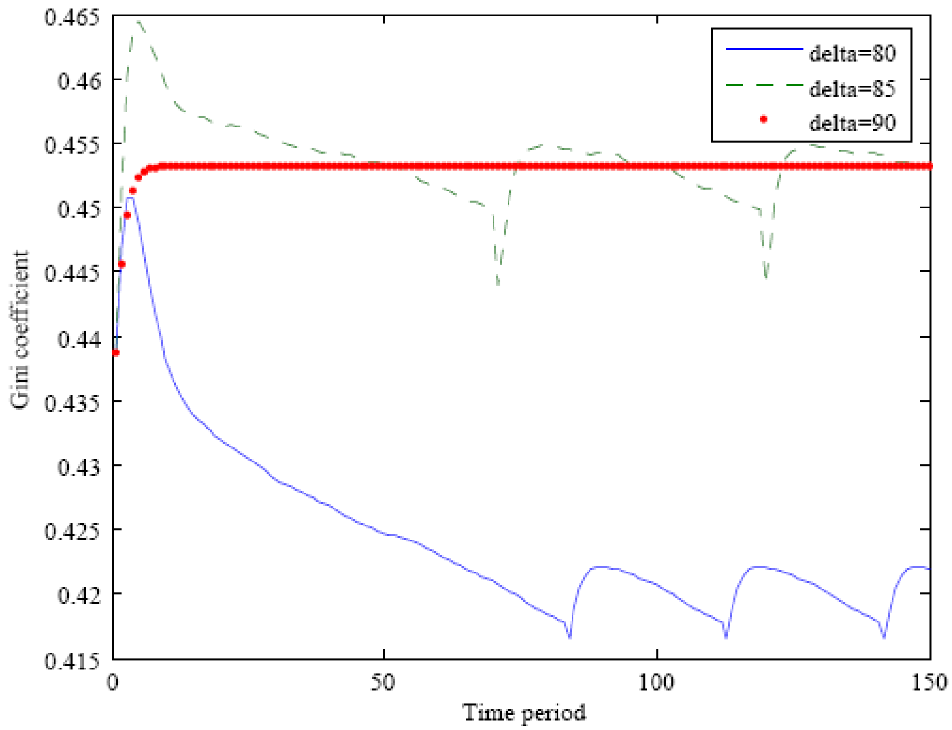

Figure 11(a): Experiments with δ, other parameters the same as the previous experiment.

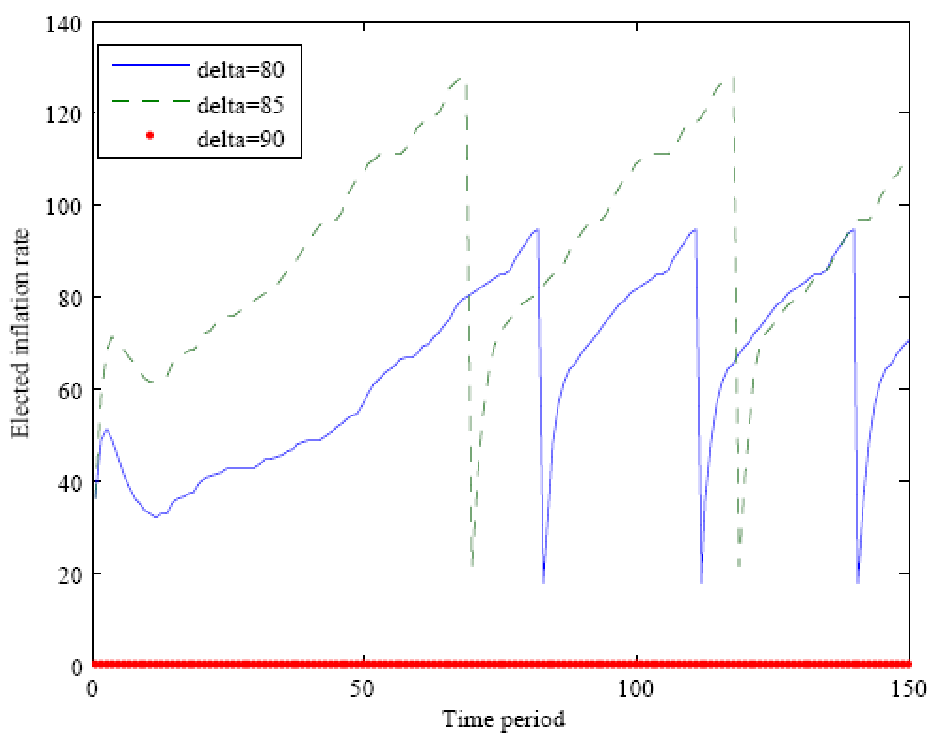

Figure 11(b): Experiments with δ, other parameters the same as the previous experiment.

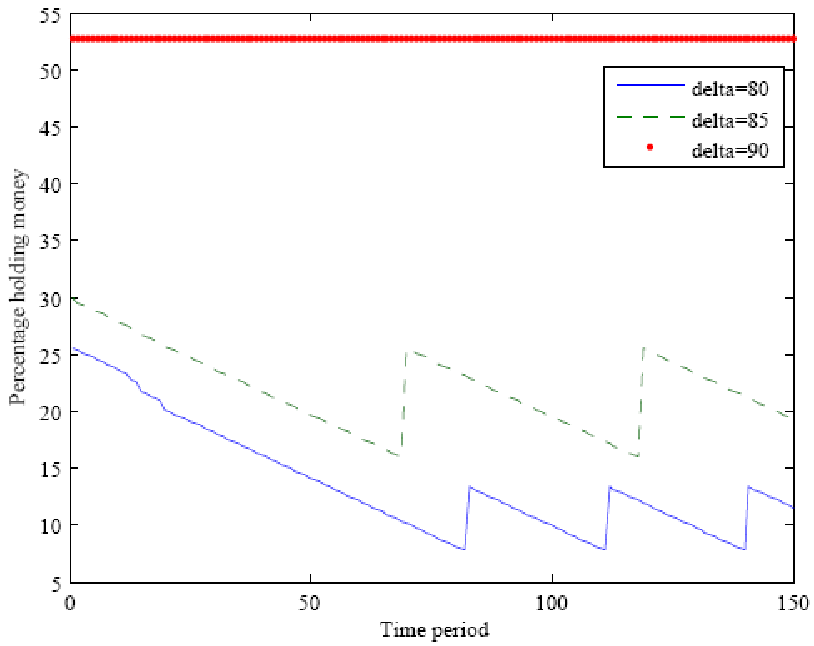

Figure 11(c): Experiments with δ, other parameters the same as the previous experiment.

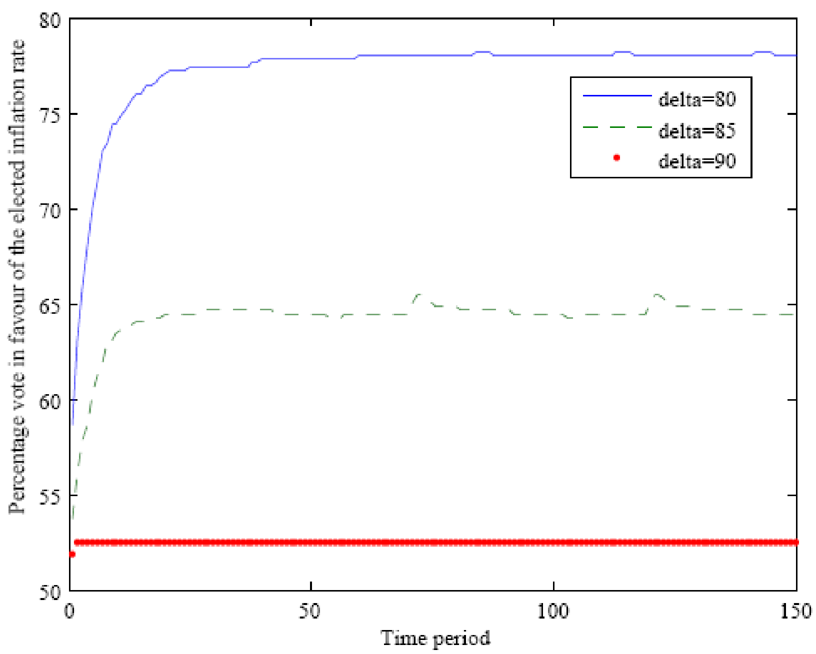

Figure 11(d): Experiments with δ, other parameters the same as the previous experiment.

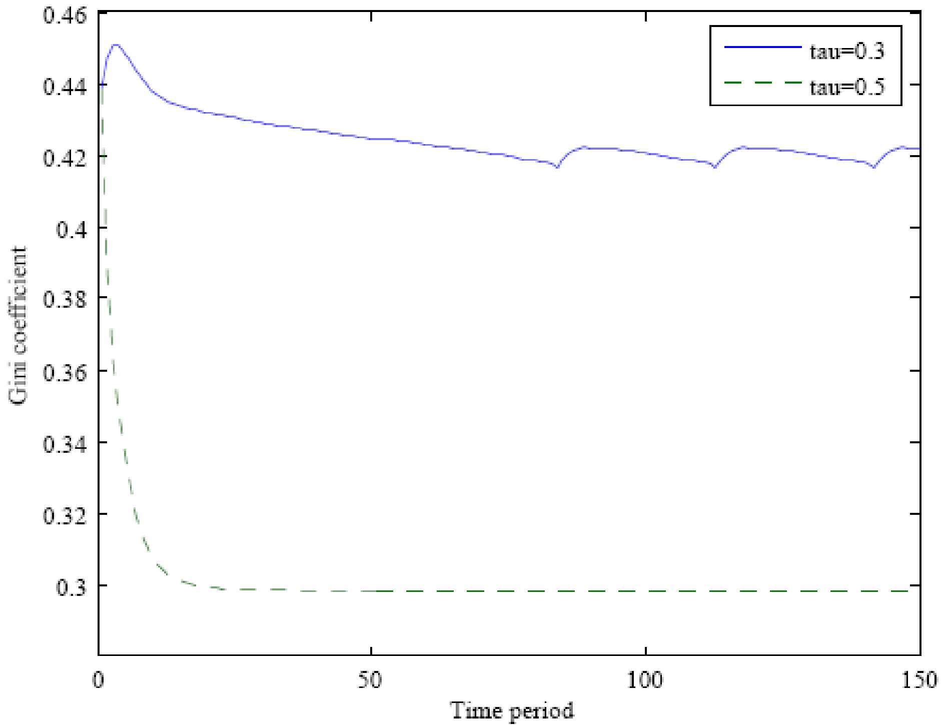

Figure 12(a): Experiments with τ , $\delta = 80$, other parameters as in figure 11.

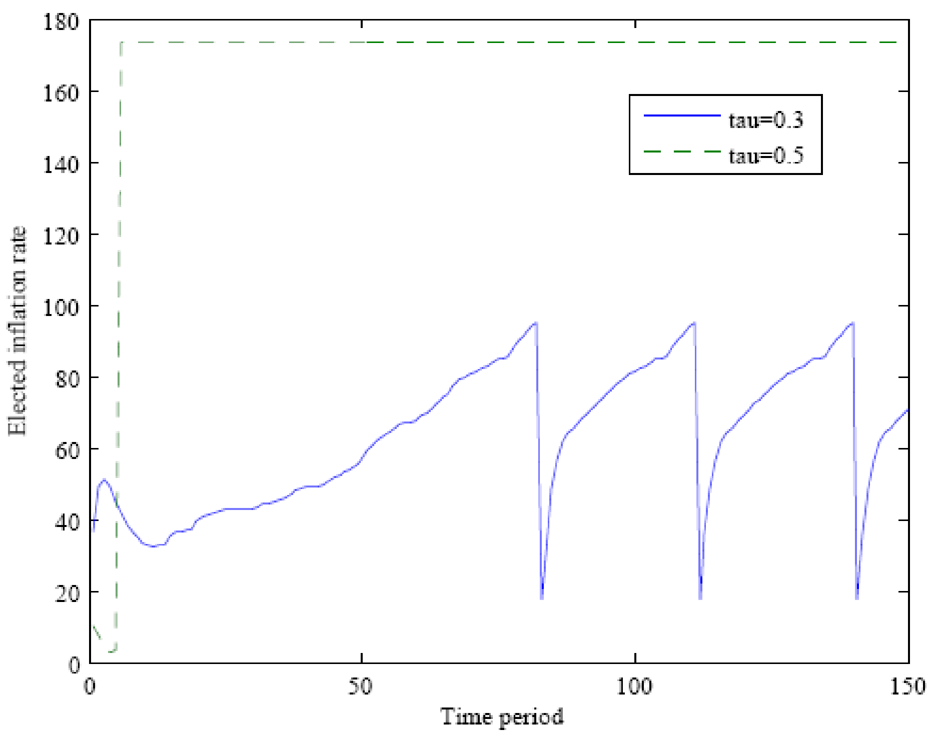

Figure 12(b): Experiments with τ , $\delta = 80$, other parameters as in figure 11.

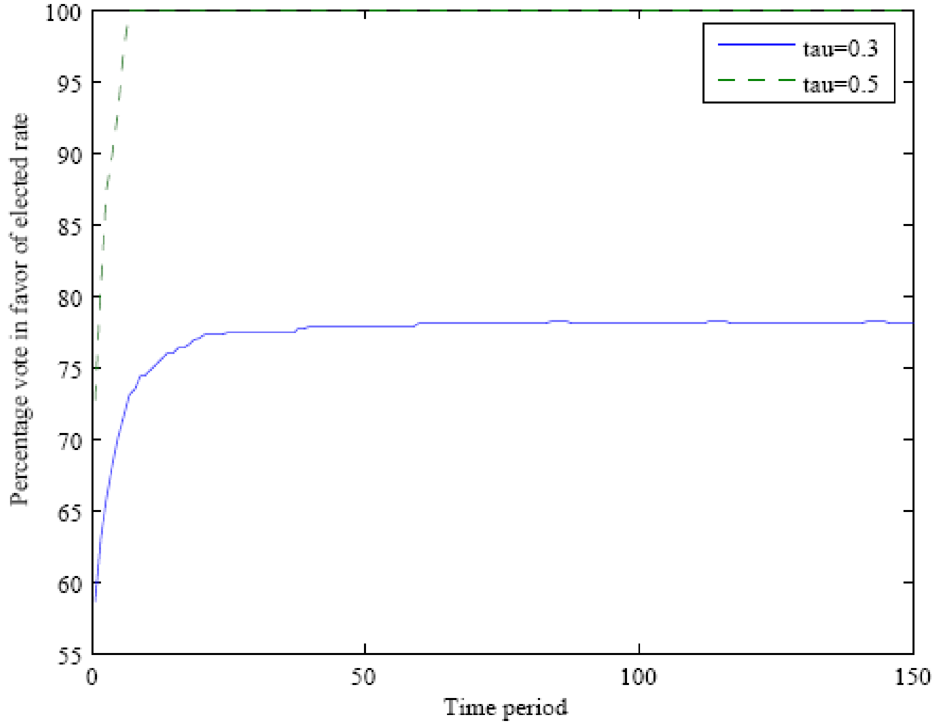

Figure 12(d): Experiments with τ , $\delta = 80$, other parameters as in figure 11.