# Dynamic Bargaining over Redistribution with Endogenous Distribution of Political Power

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**Abstract**

This paper investigates a dynamic capital taxation (and redistribution) problem with an endogenous political power balance. It is shown that the current redistribution, which reduces the future inequality, decreases the future needs for redistribution if the bargaining power is (at least partly) endogenized.

JEL classification: E62; H20; H30

Keywords: Legislative bargaining; Wealth inequality; Redistribution; Capital taxation

Highlights:

- A neoclassical growth model is considered in which legislators sequentially bargain over capital taxation (and redistribution).
- The distribution of legislators is endogenized to reflect the wealth distribution in the economy.
- High redistribution decreases the expected tax in the future.
- The relationship does not occur if we exogenously fix the balance of bargaining power.

## 1 Introduction

In most of the democratic countries, policies are sequentially chosen by negotiation among legislative representatives. In those countries, the political outcome depends on the balance of negotiation power among legislators. This negotiation power, in turn, is formed by the political decisions made in the past via changing the state of the consumers. Such feedback effects are guaranteed by political

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equality, in the sense of "one person, one vote," that updates the political power balance by reflecting the change in the balance in the economy.

In this paper, this feedback is investigated for its result on the economic inequality through legislators' political actions. The focus is on the classical capital taxation problem in a neoclassical growth economy where legislators sequentially bargain over the current tax rates. Essentially, this research comprised a dynamic general equilibrium model with a micro-foundation of legislative bargaining with the endogenous status-quo. It is shown that the effectiveness of the feedback effect depends on the political equality; how much the political power balance reflects the change in economic inequality.

Only a few papers have studied a dynamic general equilibrium model with a micro-foundation of legislative bargaining. Piguillem and Riboni [2015] study the effect of the endogenous default option (the status-quo) in a similar model except for the endogeneity of the distribution of legislators. They show that poor legislators may not propose the highest tax because it decreases their future bargaining powers via raising the status-quo. This paper, on the other hand, shows the opposite effect that the proposed tax may be decreasing in the status-quo if the distribution of legislators reflects the change in wealth distribution in the economy. Bassetto [2008] studies a model in which the Nash bargaining between the younger and older generations determines the equilibrium level of the public policies. In contrast, this study examines explicit political actions in a dynamic setting while he studies the Nash bargaining outcome in a steady state equilibrium. Due to this setting, this research explicitly studies how the current redistribution affects the future political outcomes.

The next section presents the model setup. Section 3 describes the main results. Section 4 shows the sensitivity of the feedback effects. Section 5 discusses the implication of the model and provides some future research topics.

## 2 The Model

The economy is populated by a continuum of unit measure consumers who live for an infinite number of discreet periods $(t = 0, 1, 2, ...)$. The timing of events is as follows:

(i) Production

(ii) Legislative bargaining over capital tax rate $\tau_t$

(iii) Taxation

(iv) Consumption and savings

Except for the timing of (ii), the model is a standard neoclassical growth model. The legislative bargaining process at the timing of (ii) follows a canonical model of legislative bargaining pioneered by Baron and Ferejohn [1989]. A more detailed illustration of the legislative bargaining process is provided following a brief explanation of the economic parts employed in the model.

## 2.1 ECONOMY

In each period $t$, consumers are endowed with a unit of labor which is inelastically supplied. The only possible heterogeneity among consumers is the level of asset holdings. Let $k_t$ denote the mean level of asset holdings, $\theta_t^i \in \Theta_t$ be the asset share for consumers $i$, and $\phi(\theta_t^i)$ is its density. Then, the consumers $i$ own $k_t^i = \theta_t^i k_t$ units of asset at $t$. Note that $\theta_t$ varies across time since the taxation and redistribution in the previous period affects the balance of asset holdings. We denote $\theta_t^i = \theta(\tilde{\tau}_{t-1}, \theta_0^i)$ where $\tilde{\tau}_{t-1}$ is the entire history of policies $\tilde{\tau}_t = \tau_{t-1}, \tau_{t-2}, \ldots, \tau_0$. The budget constraints for consumers $i$ are:

$$c_t^i + k_{t+1}^i \leq (1 - \tau_t) R_t k_t^i + w_t + T_t \tag{1}$$

$$k_{t+1}^i \geq 0 \tag{2}$$

where $c_t^i$ is their consumption, $R_t$ is the rental rate of capital, $w_t$ is the labor income, $\tau_t$ is the capital tax rate, and $T_t$ is the lump-sum transfer. The preference is described by:

$$\mathbb{E}_t \left[ \sum_{j=t}^{\infty} \beta^{j-t} \ln c_t^i \right] \tag{3}$$

where $\beta$ is the discount factor. The private goods are produced by a technology which uses both capital and labor. The assumed depreciation rate is 100%[1] and a Cobb-Douglas production function, $f(k_t) = k_t^\alpha$. Then, from the first-order condition, we obtain:

$$R_t = \alpha k_t^{\alpha - 1} \tag{4}$$

$$w_t = (1 - \alpha) k_t^\alpha. \tag{5}$$

The government cannot issue a debt or bond hence the total revenue from capital taxes is used to finance lump-sum transfers. The budget constraints for the government at time $t$ is given by:

$$T_t = \tau_t R_t k_t. \tag{6}$$

We now define a competitive equilibrium before describing a politico-equilibrium as a specific competitive equilibrium.

**DEFINITION 1: COMPETITIVE EQUILIBRIUM.** Given an initial condition $(k_0, \phi(\theta))$, a competitive equilibrium is defined as an allocation $\{c_t^i, k_t^i\}_{t=0}^{\infty}$ for all $i$, factor prices $\{R_t, w_t\}_{t=0}^{\infty}$, a laws of motion of asset share and its density $\{\theta_t^i, \phi(\theta_t^i)\}_{t=0}^{\infty}$ for all $i$, and a policy $\{\tau_t, T_t\}_{t=0}^{\infty}$ such that:

[1] In this setting, we implicitly assume that each period lasts half of the adult life of a consumer, which is calibrated to 30 years in section 3.

(i) The allocation maximizes Eqs. (3) subject to (1) and (2).

(ii) The factor prices satisfy Eqs. (4) and (5).

(iii) The policies satisfy Eq. (6).

(iv) Markets clear:

$$\int_{\Theta_t} c_t(\theta_t)\phi(\theta_t)d\theta_t + \int_{\Theta_t} k_{t+1}(\theta_t)\phi(\theta_t)d\theta_t = k_t^{\alpha} \tag{7}$$

(v) The laws of motion of asset share and its density are formed by consumers' optimal decisions.

### 2.2 Legislative Bargaining

There is a continuum of unit measure legislators. In each period $t$, one of the legislators is randomly selected to be an agenda setter who proposes a take-it-or-leave-it offer for the current tax rate. Then, all of the other legislators decide whether to accept the proposal $\tau_t$ or reject it. If the majority of the legislators accept the proposal, it will be implemented. Otherwise, the status-quo $q_t = \tau_{t-1}$ will be retained. For tractability, we consider a special case where the agenda setter can commit the future policy so legislators believe the current policy will remain in the future. [2]

Let $\vartheta \in \Theta$ denote the wealth share of the legislators $\vartheta$. To illustrate the effect of the political equality, it is assumed that $\vartheta$ changes according to the following simple linear function:

$$\vartheta_t = \omega\theta_t + (1-\omega)\,\vartheta_{t-1}$$

where $\omega \in [0,1]$ measures the strength of a checks and balances system on the legislature. In an extreme case where $\omega = 1$, $\mu$ equals $\phi_t$ for all $t$ implies that the distribution of legislators is completely equal to the distribution of consumers. If $\omega = 0$, on the other hand, $\mu_t$ is constant across time, $\mu_t = \phi_0$ for all $t$, implies that the distribution of legislators is exogenously fixed. In this case, the legislators do not need to consider the effect that the current policy affects the future distribution of legislators.

Henceforth, we drop the time index since the strategies are stationary. The value function for the legislator $\vartheta^i$ , $v(\vartheta_t^i, \tau_t, k_t)$, is given by:

$$v(\vartheta^i, \tau, k|q) = u(c(\vartheta^i|\tilde{q})) + \mathbb{E}\left[v(\vartheta^{i'}, \tau', k'|\tilde{q})\right]. \tag{8}$$

[2] Piguillem and Riboni [2015] study the effect of current policy choice on a future political decision, but $\mu$ is assumed to be constant for tractability.

The legislator $\vartheta^i$ support the policy $\tau$ if it provides higher utility than $q$. Therefore, their voting rule, $\varphi(\vartheta^i, \tau, k|\tilde{q})$, is described by:

$$\varphi(\vartheta^i, \tau, k|\tilde{q}) = \begin{cases} yes & if\ v(\vartheta^i, \tau, k|\tilde{q}) \geq v(\vartheta^i, q, k|\tilde{q}) \\ no & otherwise \end{cases} \tag{9}$$

and the proposal $\tau$ will be accepted if the majority of legislators accept it:

$$\int_{\varphi(\vartheta^i, \tau, k|\tilde{q})=yes} \mu(\vartheta) d\vartheta > \frac{1}{2}. \tag{10}$$

Let the legislator $i$ be selected as the agenda setter. Then the proposal rule, $\tau(\vartheta^i, \tau, k|\tilde{q})$, is given by:

$$\tau(\vartheta^i, \tau, k|\tilde{q}) = \arg\max_{\tau} v(\vartheta^i, \tau, k|\tilde{q}). \tag{11}$$

With this groundwork laid, the politico-equilibrium of our model is ready to be defined.

**DEFINITION 2: POLITICO-ECONOMIC EQUILIBRIUM.** Given $\omega$ and initial conditions $(k_0, \phi_0, \mu_0)$, a politico-economic equilibrium is defined as the value functions $v(\vartheta^i, \tau, k|\tilde{q})$, the laws of motion of asset share $\theta = h(\tilde{q}, \theta_0)$, the proposal rules $\tau(\vartheta^i, \tau, k|\tilde{q})$, and the voting rules $\varphi(\vartheta^i, \tau, k|\tilde{q})$ such that:

(i) $v(\vartheta^i, \tau, k|\tilde{q})$ and $\theta = h(\tilde{q}, \theta_0)$ are generated in the competitive equilibrium.

(ii) The proposal rules function $\tau(\vartheta^i, \tau, k|\tilde{q})$ maximizes Eqs. (11) subject to (9) and (10).

(iii) The voting rules $\varphi(\vartheta^i, \tau, k)$ satisfy Eq. (9).

Table 1: BASELINE PARAMETER VALUES

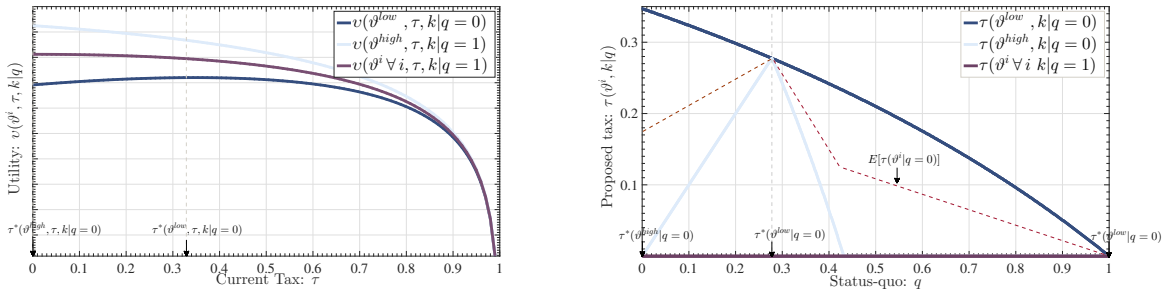
| | | | | | |
|---|---|---|---|---|---|
| $\alpha$ | 0.300 | $\{\theta^{high}, \theta^{low}\}$ | $\{1.500, 0.500\}$ | $k$ | 1.00 |
| $\beta$ | $0.5455 \approx 0.980^{30}$ | $\{\mu(\theta^{high}), \mu(\theta^{low})\}$ | $\{0.490, 0.510\}$ | $\omega$ | 1.000 |

# 3 RESULTS AND DISCUSSION

## 3.1 RESULTS

The calibrated parameter values are shown in Table 1. In this subsection, we assume that $\omega = 1$ implies the distribution for consumers and legislator coincide in every period. Without loss of generality, we assume that there exist two types of consumers $\{\theta^{high}, \theta^{low}\} \in \Theta$ where $\theta^{low} \leq E[\theta^i] \leq \theta^{high}$, where $E[\theta^i]$ denotes the average wealth share. The median consumer is assumed to be $\theta^{low}$, which implies that the median consumer has a smaller amount of wealth than that of the mean consumer.

Figure 1: UTILITY AND PROPOSED TAX




(a) UTILITY (b) PROPOSED TAX

The distribution for legislators is set to coincides with the wealth distribution, $\mu(\vartheta^i) = \mu(\theta^i)$, which implies that political equality is guaranteed in the initial period.

First, it is useful to divide the effect of taxation on the value function in the following ways:

$$\frac{\partial v(\vartheta^i, \tau, k|\tilde{q})}{\partial \tau} = \underbrace{\frac{\partial u(c(\vartheta^i, \tau, k|\tilde{q}))}{\partial \tau}}_{current\ gain} + \beta \underbrace{\mathbb{E}\left[\frac{\partial v(\vartheta^{i'}, \tau', k'|\tilde{\tau})}{\partial \tau}\right]}_{future\ gain} \tag{12}$$

As in the standard neoclassical growth model, the effect on $\tau$ is divided into two main parts: current utility gain (loss) from redistribution and disutility from the distortion of capital accumulation. Apparently, the current gain is positive for the relatively poor legislators, $\vartheta^i < E\left[\vartheta^i\right]$ and negative for the richer legislators $\vartheta^i > E\left[\vartheta^i\right]$.

The second term in Eq.12 is divided into the two parts:

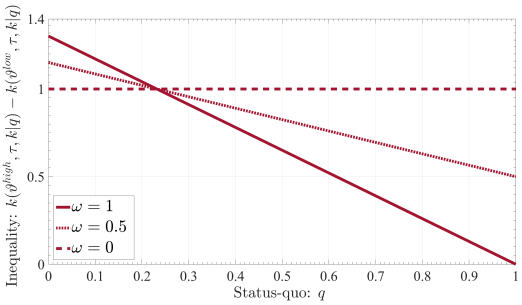
$$\underbrace{\frac{\partial v(\vartheta^{i'}, \tau', k'|\tilde{\tau})}{\partial \tau}}_{future\ gain} = \underbrace{\frac{\partial v(\vartheta^{i'}, \tau', k'|\tilde{\tau})}{\partial \vartheta^i}\frac{\partial \vartheta^i}{\partial \tau}}_{redistribution} + \underbrace{\frac{\partial v(\vartheta^{i'}, \tau', k'|\tilde{\tau})}{\partial k'}\frac{\partial k'}{\partial \tau}}_{capital\ distortion}. \tag{13}$$

Clearly, $\tau$ affects the future wealth share of the legislator by reducing the future inequality and distorting the capital accumulation.

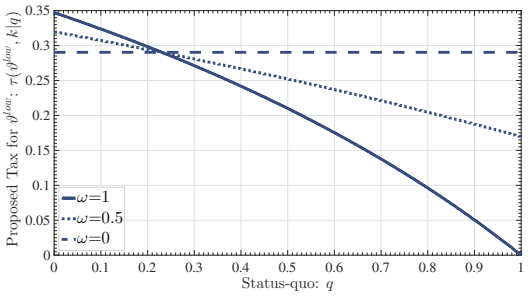
The left-hand side of Figure 1 illustrates these effects in our numerical example. Since the richer legislators $\vartheta^{high}$ loose their wealth from taxation, their utility is maximized when $\tau = 0$. The poorer legislators $\vartheta^{low}$'s utility is maximized at an interior point, since they benefit from redistribution but loose their utility from capital distortion. When $q = 1$, on the other hand, both legislators obtain the same utility due to the perfect redistribution in the prior period. In that case, the utility is maximized with $\tau = 0$ since there are no redistribution gains but tax distortions exist.

Next, we see the effect on the status-quo $q$ to the political actions which is divided into three

Figure 2: EFFECT OF VARYING POLITICAL INEQUALITY $\omega$




(a) INEQUALITY AMONG LEGISLATORS




(b) PROPOSED TAXES FOR LEGISLAOTRS $\vartheta^{low}$

channels:

$$\frac{\partial \tau(\vartheta^i, \tau, k|\tilde{q})}{\partial q} = \underbrace{\frac{\partial \tau(\vartheta^i, \tau, k|\tilde{q})}{\partial q}}_{status-quo} + \underbrace{\frac{\partial \tau(\vartheta^i, \tau, k|\tilde{q})}{\partial \vartheta^i}\frac{\partial \vartheta^i}{\partial q}}_{redistribution} + \underbrace{\frac{\partial \tau(\vartheta^i, \tau, k|\tilde{q})}{\partial k}\frac{\partial k}{\partial q}}_{capital\ distortion}. \tag{14}$$

A small increase in $q$ increases the default option in the case of disagreement and it also affects the current distribution for legislators and capital accumulation as in Eq. (13). The right-hand side of Figure 1 illustrates these effects. The status-quo channel in Eq. (14) is shown when $q$ is close to $\tau^*(\vartheta^{low})$. The legislators $\vartheta^{high}$, whose most preferred tax is always zero, need to form a coalition with the legislators $\vartheta^{low}$, since the default option is near the optimal for $\vartheta^{low}$. Therefore, $\tau(\vartheta^{high}, \tau, k|\tilde{q})$ increases if $q < \tau^*(\vartheta^{low})$ and decreases if $q > \tau^*(\vartheta^{low})$. Note that $\vartheta^{low}$ propose their most preferred tax whenever they are the agenda setters since they are the median voter. We can see the redistribution channel in Eq.14 by seeing the decreasing slope for the poorer legislators $\vartheta^{low}$. Since $q$ increases their current wealth share $\vartheta^{low}$, their proposed tax decreases with $q$.

### 3.2 POLITICAL INEQUALITY

Finally, we check the sensitivity of political equality $\omega$. The left-hand side of Figure 2 shows the impact of the difference of wealth given three values of $\omega$. When $\omega = 1$, the distribution reflects the change in economic inequality so it is decreasing in the status-quo $q$. On the other hand, it is constant when $\omega = 0$ since the identity of legislators does not change in that case. The right-hand side of Figure 2 captures the proposal for the legislators $\vartheta^{low}$ with several values of $\omega$. Apparently, the decreasing relationship between the proposal and the status-quo is weaker with a smaller value of $\omega$. When $\omega = 0$, the status-quo does not affect the proposal since the legislators' priorities do not reflect the consumers' priorities.

### 3.3 Discussion

Our model shows several interesting implications. It is well known the optimal taxation in a neoclassical growth model with initial wealth heterogeneity is the combination of the current perfect redistribution and zero long-run taxation. In our model, such policies can be achieved if the poor legislators are the agenda setters in the first period and political equality is guaranteed. This finding provides an interesting implication to the recent increasing inequality and declining tax progressivity in advanced countries.[3] Our result theoretically explains the failure of the check in advance for political power balance may cause such as the interaction which is suggested by Bonica et al. [2013].

A promising future research proposal is the investigation of the cause of the political inequality $\omega$ in the model. (e.g. adding the electoral phase or the term of office to the model). Such studies might provide more detailed understanding of the relationship between political institutions and economic inequality. Finally, the relation to the empirical findings in the literature of comparative politics is also promising. Since Duverger [1959]'s influential research, tremendous papers on comparative politics have studied the relation between political institutions and political as well economic outcomes [Lijphart, 2012]. By extending the model, it might shed some light on the different political-economic environments across countries.

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[3] For example, Piketty and Saez (2013) studied that the top inheritance tax rates observed in the United States in the years 2000-2010 are closer to the optimum from the viewpoint of the wealthiest top 10-20% of consumers while it had been the bottom 60-70% of consumers until the years 1970-1980.