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Abstract

This paper studies investment decisions by economic agents in cases where the tax rate is decided through voting. It will be shown that, in some cases, *only* a Pareto-dominated tax policy on the wrong side of the Laffer curve is supported under rational expectations. Thus, the governments may collect revenue in an inefficient way. To that end, a quite plausible assumption, the endogeneity of the return on investment, is essential. Therefore this paper warns about the danger of inefficiency in a wide variety of policies. Further, the model predicts that when the inequality in an economy is low, the tax policy on the wrong side is likely to arise.

Keywords: Political economy; The Laffer curve; Inefficiency in fiscal policies

JEL Classification: E22, E62, H21

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1 Introduction

It is believed that govenmental policy is responsible for economic development. Especially, the tax policy affects citizens' behaviors with regard to labor supply and capital accumulation, and thereby determines the development level. Therefore, the institution defining how to decide economic policies is an important element in economic growth. Recently, studies on political economy increasingly suggest that policies are not determined by a benevolent government, but that conflicts among self-interested agents are somehow coordinated in a certain way and then policies determined. In this context, this study uses a political economy model with investment decisions by citizens to show that an inefficient policy may emerge. Here, an inefficient policy refers to the tax policy along the wrong side of the Laffer curve, which is Pareto-dominated. Therefore, although the government can raise the same level of revenue with a lower tax rate, it chooses a higher tax rate and consequently suffers from less investment. The focus of the paper is to show that such an inefficient policy is a unique equilibrium.

The model used in this paper is a simple two-period general equilibrium model. Individuals differ in capital holdings at the beginning. They invest capital for next period consumption, expecting the return on capital and tax rate chosen in the future. In the model, the tax is levied only on capital income, which is politically determined by majority voting. It is well known that endogenous policy determination coupled with investment decisions is likely to support multiple rational expectations on both sides of the Laffer curve.[1] Saint-Paul and Verdier (1997) analyze the case when a country is subject to multiple equilibria and ascertain how these are sustained. They use a model where agents have different capabilities to access world capital markets. In their model, multiple equilibria are likely to occur when the decisive voter on tax policy has a higher elasticity for tax evasion than the average voter. However, their equilibria consist of two scenarios: multiple equilibria with low and high taxes; and a unique low-tax equilibrium. The present paper offers another scenario, that of a unique high-tax equilibrium on the wrong side of the Laffer curve. For such analysis, this paper emphasizes that the endogeneity of capital return is essential for an inefficient revenue

[1] Persson and Tabellini (2000, Ch. 12) discuss the multiplicity problem, using a simple dynamic taxation model.

collection by the government.

As discussed above, the multiplicity of equilibria is pervasive in dynamic taxation models with endogenous policy making. A Pareto-dominated equilibrium is often seen as a coordination failure among economic agents. And this disastrous equilibrium is sometimes ignored by assuming that economic agents can somehow coordinate their expectations (Persson and Tabellini (1994)). However, it is shown in this paper that there can be no room for coordinations and that the disastrous outcome may be inevitable.

Some literature in public economics show that the tax rate can be on the declining portion of the Laffer curve (Yitzhaki (1987) and Slemrod and Yitzhaki(2002)). However, these studies differ from this paper in the sense that the tax policy is exogenously given. This paper is also related to Traxler (2012), who studies welfare consequences of the tax policy determined by majority voting in a model of tax avoidance. Traxler (2012) shows that the politically determined tax rate is generally inefficient. However, the terminology "inefficient" used in Traxler (2012) differs from the one used in this paper. Traxler (2012) says "inefficient" when there is a divergence from the welfare-maximizing policy according to a certain welfare function. On the other hand, this paper uses the term "inefficient" if the policy is worse for everyone, i.e. Pareto-dominated, compared to another feasible policy. In fact, a Pareto-dominated tax policy is never an equilibrium in Traxler (2012). Buchanan and Lee (1982) explains how the tax rate on the wrong side of the Laffer curve would be sustained with endogenous policy determination by political decision makers. Their arguments depend on the assumption that the political decision makers are more short-sighted than citizens. Short-sighted politicians do not take into account the effect that a high tax rate today distorts resource allocations in the future. And they seek an increased government revenues with a high tax rate today, which is so high and beyond the peak of the long-run Laffer curve.[2] The present paper provides an alternative mechanism to end up with such a Pareto-dominated policy. Two critical assumptions, but plausible, lead to inefficiency. The one is, as mentioned above, the endogeneity of the return on investment. The other is the timing of policymaking, or

[2]Further, using a political contest model between politicians and citizens, Ihori and Yang (2012) point out that a tax rate beyond the peak has an effect to undermine political efforts by citizens. And they show the possibility to have a tax rate on the right side of the Laffer curve. Wrede (2000) analyzes the case where a number of governments put taxes on shared tax sources, which can result in overtaxation on the downward-sloping part of the Laffer curve.

put differently, a lack of commitment. Because the two conditions are common features in real-life economies, the model has a general applicability and can be extended to analyze a wide range of policies.

For a positive analysis, the model predicts that when the inequality in an economy is low, the tax policy on the wrong side of the Laffer curve is likely to occur. This result is consistent with Trabandt and Uhlig (2011). They use a neoclassical growth model to calibrate and show that Denmark and Sweden are on the wrong side of the Laffer curve for capital taxation. On the other hand, countries with high inequality, such as U.S. and U.K., are on the left side. Therefore this paper gives a rationale for their results.

The rest of paper is organized as follows. Section 2 sets up the model. The equilibrium policy is derived and investigated in Section 3. Section 4 discusses the assumptions in the model and offers some extensions. Finally, Section 5 concludes.

2 Model

Individuals with a mass of 1 are inhabitants of an economy. They live for two periods and differ with respect to capital holdings $b_i \geq 0$ at period 1. Its cumulative distribution function is denoted by $G(\cdot)$. Its mean is denoted by $\bar{b}$. In the first period, each individual receives his income for supplying one-unit labor and renting their capital to a competitive firm. The consumer either consume or save his income. In the second period, he supplies one unit of labor inelastically, and receive capital income from their savings.

An agent's preference is defined over consumption in both periods and public goods in the second period, and given by

$$\begin{aligned} U(c_{i,1}, c_{i,2}) &= u(c_{i,1}) + \beta(u(c_{i,2}) + v(x)) \\ &= \log c_{i,1} + \beta(\log c_{i,2} + \gamma \log x), \end{aligned} \tag{1}$$

where $c_{i,1}$, $c_{i,2}$ respectively represent the first and second period consumption for an agent i and β denotes a discount factor. The level of public goods provided by government is represented by $x \geq 0$. The budget constraint of individual i is given by

$$\begin{cases} c_{i,1} + s_i = w_1 + r_1 b_i \\ c_{i,2} = w_2 + (1-\tau) r_2 s_i \end{cases}, \tag{2}$$

where s_i, w_t, r_t and τ denote the saving of individual i at period 1, the wage rate at period t, the return on capital at period t and the capital income tax rate, respectively. Note that capital fully depreciates in the second period. Also, for simplicity, it is assumed that the government can levy a tax only on capital income.

In each period, competitive firms maximize their profit according to the following production function,

$$F(K_t, L_t) = AK_t^{\alpha} L_t^{1-\alpha}. \tag{3}$$

In the second period, the government collects its revenue from capital income tax to provide public goods. The government budget is

$$x = \int \tau r_2 s_i dH(s_i), \tag{4}$$

where $H(\cdot)$ is the cumulative distribution function of saving from period 1, which is generated through the first-period decisions by individuals. It is assumed that the government can use the technology which translates one final good into one public good.

As in Persson and Tabellini (2000, Ch. 12) and others, the timing of events is as follows; investment decisions followed by voting on the tax rate.

1. In the first period, each individual decides how to allocate income between consumption and saving.

2. At the end of the first period, the tax rate on capital income is decided through a majority voting.

3. In the second period, given the tax rate, individuals consume their income and gain benefits from public goods provided by the government.

Note that individuals make their decisions before the tax policy is determined. Therefore, they must expect which level of capital tax will be imposed in the second period.[3] This timing of events is crucial for the following results. The wrong side of the Laffer curve is never chosen if the first and second events are replaced. It is because, if the tax policy chosen is on the wrong side, there must exist a better way to collect the government revenue without any loss. However, when the timing is as above, there can be an equilibrium with the right side of the Laffer curve.

3 Equilibrium Analysis

This section provides the equilibrium of this economy. It is shown, in some cases, that only the wrong side of the Laffer curve is an equilibrium. Note that economic agents have a perfect foresight. And an equilibrium refers to a rational expectations equilibrium.

3.1 Equilibrium

The return on each production factor for $t = 1, 2$ is given by

$$\begin{cases} r_t = \alpha A K_t^{\alpha-1} L_t^{1-\alpha} \\ w_t = (1-\alpha) A K_t^{\alpha} L_t^{-\alpha} \end{cases} . \tag{5}$$

By maximizing utility (1) with the budget constraint (2), the consumers' saving function is obtained as

$$s_i(\tau^e) = \frac{\beta}{1+\beta}(w_1 + r_1 b_i) - \frac{1}{1+\beta}\frac{w_2}{(1-\tau^e) r_2}, \tag{6}$$

where τ^e denotes the expected capital tax rate. Note that the saving of each agent is decreasing in the expected capital tax rate ($\partial s_i(\tau^e)/\partial \tau^e < 0$).

Because the labor supply is fixed to the number of population, the labor market

[3] It can be interpreted as follows: the government promises a tax policy at the beginning of the first period, but cannot commit to that. The actual policy is chosen at the end of the first period by taking private agents decisions as given.

clearing condition is

$$L_t = 1 \text{ for } t = 1, 2. \tag{7}$$

The amount of capital supplied to the market in the first period is fixed and given by the total amount of capital holdings at the beginning. However, its amount in the second period is endogenously determined through saving decisions by agents. Therefore, using (6), the conditions to clear the capital market are obtained as follows.

$$\begin{cases} K_1 & = \bar{b} \\ K_2 & = \int s_i dH(s_i) \\ & \equiv \int \frac{\beta}{1+\beta}(w_1 + r_1 b_i) - \frac{1}{1+\beta}\frac{w_2}{(1-\tau^e)r_2} dG(b_i) \end{cases} . \tag{8}$$

At the voting stage, as each individual's capital holding for period 2 is already predetermined, the tax policy does not distort capital accumulation from then on. Therefore, the wage rate and the return on capital are fixed at the voting stage. The preferred tax policy for the agent with the saving of s_i solves the following

$$\max_{\tau} \beta(u(c_{i,2}) + v(x)),$$
$$\text{subject to } \begin{cases} c_{i,2} = w_2 + (1-\tau) r_2 s_i \\ x = \int \tau r_2 s_i dH(s_i) \end{cases},$$
$$\text{given } w_2, r_2 \text{ and } [s_i]_{i=0}^{1}.$$

The first-order condition for this problem is

$$-\frac{r_2 s_i}{w_2 + (1-\tau^i) r_2 s_i} + \frac{\gamma}{\tau^i} = 0, \tag{9}$$

where τ^i is defined as the best policy for the individual with s_i.[4] The first term represents the utility loss as the tax rate marginally increases. The second term is the marginal

[4]Here $\tau^i \geq 1$ is allowed. However, any policy with $\tau \geq 1$ is excluded as an equilibrium, since it is unrealistic.

benefit from an increased amount of public goods. Note that because of the log utility, the preferred policy is irrelevant to redistributive concern and does not depend on other agents' savings. In this economy, the policy is determined by a majority voting. The equilibrium policy never loses against any policy in a pair-wise voting, which is called the Condorcet winner. Because agents' preferences are single-peaked, there exists a unique Condorcet winner, the policy which the median voter prefers, τ^{med}.[5] For expositional reason, assume that the median has more wealth in the first period than the mean.[6] This assumption is justified by the observation that rich individuals have a high propensity to give political contributions. When rich voters engage in political activities more than poorer ones, the "politically median" voter should be richer than the actual median voter, and could be richer than the mean. Rosenstone and Hansen (1993) presents the data which shows the propensity to participate in every form of political activity rises with income.[7]

Equations (5), (6), (7), (8), (9) and the rational expectations requirement $\tau^{\text{med}} = \tau^e$ jointly determine the equilibrium. Hereafter, the equilibrium tax rate is represented by τ^*.

3.2 the Laffer curve

In order to evaluate the equilibrium policy obtained in the previous section, this section provides the configuration of the Laffer curve. The Laffer curve is the relationship between the tax rate and the government revenue.

The government's revenue Π is defined as

$$\Pi \equiv \int \tau r_2 s_i dH(s_i).$$

Combining (5), (6), (7) and (8), Π can be calculated as follows.

[5] See Persson and Tabellini (2000).

[6] It ensures that the equilibrium policy is unique (see the Appendix).

[7] Benabou (2000) employs the assumption that voters with more wealth have more votes. Bourguignon and Verdier (2000) also uses this kind of assumption in a theoretical model. They suppose that individuals with enough income (or education) have a right to vote. This is motivated by historical examples that voting rights were restricted to individuals with enough property.

$$\Pi = \alpha A\tau \left(\frac{\beta A\bar{b}^{\alpha}}{(1+\beta) + \frac{1-\alpha}{\alpha}\frac{1}{1-\tau}} \right)^{\alpha}. \tag{10}$$

The Laffer curve in this model is unimodal, as usual. The tax rate which attains the maximal government revenue, $\tau^{\max}$, is obtained from the first order condition for (10). That tax rate satisfies $\tau^{\max} \in (0,1)$ and the following equation,

$$\partial\Pi/\partial\tau = 0 \Longleftrightarrow$$
$$(1+\beta)(\tau^{\max})^2 - \left[2(1+\beta) + \frac{1-\alpha}{\alpha}(1+\alpha)\right]\tau^{\max} + (1+\beta) + \frac{1-\alpha}{\alpha} = 0.$$

3.3 Inefficiency in fiscal policy

This subsection investigates whether the tax rate determined through voting is on the left or right side of the Laffer curve. To see this, compute the equilibrium tax rate. Combining (5), (7) and (8), the aggregate capital holdings at period 2 is obtained, depending on the expected tax rate.

$$K_2 = \frac{\beta A\bar{b}^{\alpha}}{(1+\beta) + \frac{1-\alpha}{\alpha}\frac{1}{1-\tau}} \equiv \Phi(\tau). \tag{11}$$

$\Phi(\tau)$ reveals the intuitive relationship that the capital accumulation is decreasing in the tax rate. Next, using (5), (6), (7) and (9), the median-preferred tax policy can be obtained, relating to the aggregate capital.

$$K_2 = \frac{\alpha}{1-\alpha}\frac{\beta A[(1-\alpha)\bar{b}^{\alpha} + \alpha\bar{b}^{\alpha-1}b_{\text{med}}](\tau - \gamma(1-\tau))(1-\tau)}{\beta\gamma(1-\tau)+\tau} \equiv \Omega(\tau). \tag{12}$$

Figure 1 shows the equilibrium policy determination at the intersection of the two functions. It can be shown that the equilibrium tax rate τ^* is unique and interior.[8]

If the condition below is satisfied, the politically-determined tax rate is beyond the

[8]See the Appendix.

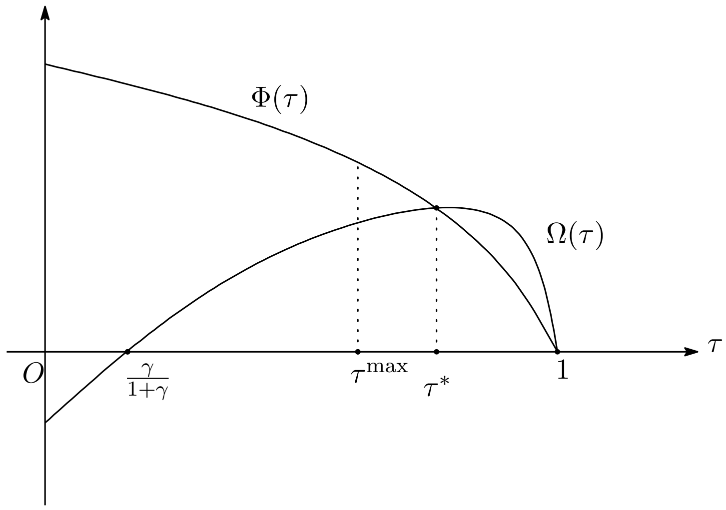

Figure 1: Equilibrium policy on the wrong side of the Laffer curve

peak of the Laffer curve and gets trapped into inefficiency.[9] If this is the case, the tax policy is Pareto-dominated and there exists an alternative that every agents prefers.

$$\Phi(\tau^{\max}) > \Omega(\tau^{\max}). \tag{13}$$

In what situations, this inefficient tax collection is likely to arise? First, when the inequality of the economy, relative richness of the median to mean, is small (low inequality), the inefficiency in fiscal policy tends to occur. It is because the median with a lower capital holdings prefers a higher tax rate as the tax burden of less wealth is small (see equation (9)). Trabandt and Uhlig (2011) calibrates a neoclassical growth model and argues that Denmark and Sweden are on the "wrong" side of the Laffer curve for capital income taxation, while other high-inequality countries like U.S. are on the left side. Their results are consistent with the observation in the model that countries with low inequality are likely to suffer from inefficient fiscal policies. Second, the preference for public goods is also important. The reason is quite simple. When the preference for public goods is strong, the median demands a higher tax rate to obtain more public goods.

However, why is it impossible to have the lower tax rate which attains the same

[9] The parameter set which satisfies the assumptions and equation (13) is reasonably large. For a quantitative example, $A = 1, \alpha = 0.3, \beta = 0.5, \gamma = 2, \bar{b} = 1, b_{\text{med}} = 2$.

government revenue as τ^*? That tax policy, say $\hat{\tau}$, must be better for every agent (Pareto-dominating τ^*), since it achieves the same revenue (consequently, the same level of public goods) and incurs less distortion to economic activities. Consider the situation that the tax policy is committed to be $\hat{\tau}$ and that every individual believes it. Then the aggregate investment in the economy would increase and the return on capital would be low. Observing this, which tax rate would the median choose? Because the tax burden is now small due to the low return on capital, the median would never prefer $\hat{\tau}$ and adopt another higher tax rate. Therefore the commitment for the tax rate $\hat{\tau}$ is not credible. It is the reason why the Pareto-dominating policy, $\hat{\tau}$, is not supported under rational expectations.

4 Discussion

This section discusses a few assumptions which are crucial to get the main results in this paper. Also, some extensions will be provided.

4.1 Discussion on assumptions

There are two critical assumptions in the model. First, it is the timing of events; the policy determination after investment decisions. If the policy is decided at the beginning, the tax rate would never be on the wrong side.[10] The second is the endogeneity of return on capital. With exogenous return on capital, Pareto-dominating tax rate $\hat{\tau}$ is also an equilibrium policy. Whichever the median voter commits $\hat{\tau}$ or τ^*, both are credible. And two tax rates can be rational expectation equilibria, because the median does not change preferred tax rate with exogenous return.[11] There are some previous studies which show two possible tax rates on both sides of the Laffer curve with exogenous return on capital (Saint-Paul and Verdier (1997) and Persson and Tabellini (2000, Ch. 12)). The distinct feature of this model is that only the wrong side can be a rational expectation equilibrium, incorporating the endogenous return on investment. The multiplicity issue is well known in dynamic taxation models with endogenous policy making. A Pareto-dominated equilibrium is often seen as a coordination failure among economic agents.

[10] Another interpretation is that a lack of commitment results in the inefficiency in fiscal policy.
[11] When endogenous return on capital, recall the argument in the last paragraph in Section 3.

And this disastrous equilibrium is sometimes ignored by assuming that economic agents can somehow coordinate their expectations (Persson and Tabellini (1994)). However, this paper emphasizes that there can be no room for coordinations and that the disastrous outcome may be inevitable.

4.2 Extensions

For a very simple model, several extensions would be available. The same structure applies for many policy-determining situations. For instance, a child allowance may be a good example. Families decide how many children to have before the fiscal policy on a child allowance is adopted. Because the government budget is usually approved annually, while the decision for the quantity of children is a long term decision. And the return on a child in terms of the wage earned by each child is endogenous, because of the wage rate determination through the labor market in the future. Therefore there is a possibility that a child allowance policy can be on the "wrong side" among possible policies. Another example is education. Consider an income tax and agents' education decisions. Younger voters have to decide whether to receive higher education before their voice in political spheres is empowered compared to older voters. Therefore the policy choice led by young voters is postponed long after education. Of course, the return on education depends on relative scarcity of skilled workers to unskilled workers, which is endogenous. Hence, as is the case with child allowance, a politically determined income tax rate may be Pareto-dominated and too high so that it excessively distorts education decisions. Calvo (1988) shows that multiple equilibria may arise in a model of public debt repayment. There exist a Pareto-efficient equilibrium where there is no debt repudiation and a Pareto-inefficient equilibrium in which debt is partially repudiated. This is analogous to multiple equilibria on both sides of the Laffer curve in Persson and Tabellini (2000, Ch. 12). By endogenizing the relevant variable in Calvo (1988),[12] it may lead to a unique inefficient outcome.

[12] In his model, the interest factor of the public debt is exogenous. However, it seems natural to think that the interest factor is increasing in the total amount of outstanding bonds.

5 Conclusion

This paper shows that an endogenous tax policy may generate an extremely inefficient government activity, the wrong side of the Laffer curve. To that end, there are two critical, but totally plausible, assumptions; the timing of policy making and endogeneity of the return on capital. Because some tax policies are determined after agents' decision makings, the government's performance can often get trapped into inefficiency. This point is repeatedly emphasized in previous studies which argue multiple policies on the both sides of the Laffer curve can be possible. However, together with the endogeneity of the return on capital, citizens may suffer from the wrong side of the Laffer curve, the unique possible outcome. The mechanics of the model have a general applicability and can be extended to analyze a wide range of policies.

Appendix

Uniqueness of the interior equilibrium tax rate

To obtain the equilibrium tax rate, solve the following equation,

$$\Phi(\tau) = \Omega(\tau),$$

$$\iff \frac{\beta A \bar{b}^{\alpha}}{(1+\beta) + \frac{1-\alpha}{\alpha}\frac{1}{1-\tau}} = \frac{\alpha}{1-\alpha}\frac{\beta A[(1-\alpha)\bar{b}^{\alpha} + \alpha \bar{b}^{\alpha-1} b_{\text{med}}](\tau - \gamma(1-\tau))(1-\tau)}{\beta\gamma(1-\tau)+\tau}. \tag{A.1}$$

Because (A.1) is a third degree equation, the number of solutions is at most three. Also note that $\tau = 1$ is an obvious solution. Thanks to $b_{\text{med}} > \bar{b}$, the following inequality is straightforward,

$$0 > \frac{d}{d\tau}\Phi(\tau)\Big|_{\tau=1} > \frac{d}{d\tau}\Omega(\tau)\Big|_{\tau=1},$$

which implies that the slope of $\Omega(\cdot)$ is steeper than that of $\Phi(\cdot)$ at $\tau = 1$, as shown in Figure 1. Note that $\Phi(0) > 0 > \Omega(0)$. By the continuity of both functions, it follows that the interior solution must be unique. □

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