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The dynamic welfare cost of seignorage tax and consumption tax in a neoclassical growth model with a cash-in-advance constraint

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ABSTRACT

Using a public finance approach, this study investigates welfare costs between seignorage and consumption taxes in a standard growth model. One of these two taxes is used to finance exogenous public spending to balance the government budget. The steady-state welfare cost of consumption taxes is lower if the consumption effect dominates the leisure effect. This paper compares equilibrium along transitional dynamic and steady-state paths and finds that because of lower consumption and leisure and thus higher welfare costs of consumption taxes during early periods, the welfare cost of consumption taxes is larger than the welfare cost of seignorage taxes.

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1. Introduction

Monetary economists have devoted considerable effort to measuring the welfare cost of seignorage. The traditional approach treats real balances as a consumption good and seignorage as an inflation tax on real balances. Although some studies have found a large welfare cost of inflation and others uncovered a small welfare cost of inflation, the findings generally established a negative relationship between inflation and welfare.¹ In this body of research, the optimal inflation tax is such that the nominal rate of interest calls for deflation at the rate of time preference, or a zero nominal interest rate, known as the Friedman rule (Friedman, 1969).

Alternatively, there is a line of research that studies monetary policy following a public finance approach. This approach was started by Phelps (1973). In an environment where a lump-sum tax is not available, Phelps (1973) argued against the Friedman rule and showed that all goods, including real balances, would be taxed in a Ramsey-like fashion. In dynamic general equilibrium models, the issue was re-examined by Chari et al. (1991) and Braun (1994) in terms of the welfare cost between a seignorage tax and an income tax. These two sets of authors employed a Lucas and Stokey (1983) model without capital and with cash goods and credit goods. Under a class of preference, the results in Chari et al. (1991) were supportive

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¹ Examples include Fischer (1981), Cooley and Hansen (1989), Kimbrough (1986), Prescott (1987), Cole and Stockman (1992), Gillman (1993), Gomme (1993), Mino and Shibata (1995), Dotsey and Ireland (1996), Ireland (1994, 2007), Aiyagari et al. (1998), Wu and Zhang (2000), Erosa and Ventura (2002), Itaya and Mino (2003) and Chen et al. (2008). See Lucas (2000) for a survey.

of the Friedman rule of zero nominal interest rate, while under a more general specification of preference, the conclusion of Braun (1994) was in favor of a seignorage tax instead of the Friedman rule.²

Later, Palivos and Yip (1995) followed the public finance approach used by Chari et al. (1991) and Braun (1994). Palivos and Yip (1995) investigated endogenous growth models with a cash-in-advance constraint. In their work, consumption and a fraction of investment are cash constrained. They compared the welfare cost between a seignorage tax and an income tax as alternative ways of financing exogenous public spending along a balance growth path, as do Chari et al. (1991) and Braun (1994). They found that in the long run, the welfare cost of a seignorage tax is lower than that of an income tax on the condition that a sufficiently large fraction of investment is with a cash constraint. Their results are in supportive of Braun (1994) but not Chari et al. (1991) and suggested an optimal inflation tax higher than the Friedman rule. All of the papers above compared a seignorage tax with an income tax, a tax that is known to be dynamically inefficient in the long run since Judd (1985) and Chamley (1986).³

In a recent paper Ho et al. (2007) offered a comparison of the welfare cost between a seignorage tax and a consumption tax in the public finance approach in a model with real balances and leisure in utility. They found that without a production externality, a seignorage tax always had a higher welfare cost than a consumption tax in the long run. With a production externality, a seignorage tax not only had a smaller welfare cost than a consumption tax but may have a welfare gain.

In this paper, we revisit the comparison of the welfare cost between a seignorage tax and a consumption tax in the public finance approach. In particular, we compare the overall welfare cost along both the transitional dynamic path and the steady state. Existing literature studied welfare comparisons in steady state but not along transitions. We envisage the issue in a model with a cash-in-advance (henceforth, CIA) constraint. We choose a CIA approach because, except for Ho et al. which used a money-in-utility (henceforth, MIU) approach, all of the above-mentioned dynamic growth models are analyzed in a CIA approach. We study an otherwise standard growth with a general a CIA constraint in which the government spending is financed by consumption and seignorage taxes.

We find the following results. First of all, when investment is constrained by cash, switching from a consumption tax to a seignorage tax lowers consumption but has an ambiguous effect on leisure in the long run. As a result, the welfare cost of a consumption tax is lower than the welfare cost of a seignorage tax only if the harmful effect through lower consumption dominates. Second, when we consider the transition effect, a consumption tax reduces more consumption and has a higher welfare cost during early periods than a seignorage tax. Thus, the overall welfare ranking between the two taxes is theoretically ambiguous. Finally, our quantitative results indicate that under plausible rates of time preferences, the overall welfare cost of a seignorage tax is lower than that of a consumption tax.

In our first result, the welfare cost of a seignorage tax is lower than that of a consumption tax only if there is a cash constraint on investment and the harmful effect via consumption dominates. Without a cash constraint on investment, a seignorage tax is like a consumption tax and both taxes affect equilibrium allocation in a symmetric way. This result cannot arise in Ho et al. even if the degree of consumption is the same as the degree of real balances in utility since real balances directly affect the utility so the marginal utility of real balances affects the marginal cost of holding capital and thus the tradeoff between consumption and savings. Moreover, when investment is constrained by cash, leisure may increase in response to both taxes. In particular, a seignorage tax may result in a higher leisure than a consumption tax, which case materializes if the positive effect on leisure due to the complement of capital and labor in production (and thus the substitute between capital and leisure) dominates the negative effect on leisure due to the complement between consumption and leisure in utility. As a result, the welfare cost of a seignorage tax may or may not be higher than the welfare cost of a consumption tax in the long run. The welfare cost of a seignorage tax is unambiguously higher than the welfare cost of a consumption tax in the long run only when the consumption effect dominates.

The second result is the main innovation in our study. Our second and third results together stipulate that the overall welfare cost of a seignorage tax is smaller than a consumption tax. This result is similar to that in Ho et al., but is based on a different time horizon. While the result in Ho et al. is held only in the long run, our result is obtained in the transition and the steady state as a whole.

Since our second result is the key innovation in this study, we explain its reasons as follows. Under a CIA constraint on investment, the constraint affects the agent's tradeoff between consumption in t and savings/investment in t . Investment in t (which is related to consumption in $t + 1$) needs real balances and is affected by the after-tax shadow price of real balances in $t + 1$. As a result, if a period t consumption tax is imposed, it affects the intertemporal tradeoff between consumption in period $t - 1$ and t . However, if a period t seignorage tax is imposed, it affects the intertemporal tradeoff between consumption in period t and $t + 1$, but not the tradeoff between consumption in period $t - 1$ and t . Thus, while a consumption tax in t exerts effects on the tradeoff between consumption in $t - 1$ and t , a seignorage tax in t affects the tradeoff between consumption in t and $t + 1$. Because of this one-period earlier effect in a consumption tax, when the tax code is changed in period t , consumption is reduced more under period t consumption tax than under period t seignorage tax. This effect persists over time so the path of consumption is lower under a consumption tax. As leisure is a complement to consumption, leisure is also lower in a

² While Chari et al. (1991) required the preference to be homogenous in the two consumption goods and weakly separable in leisure activities, Braun (1994) assumed a more general preference that includes the one used in Chari et al. (1991) as a special case.

³ In an endogenous growth model with a loan constraint in a Diamond and Dybvig (1983) framework, Espinosa-Vega and Yip (2002) also compared the welfare cost of a seignorage tax with that of an income tax. They failed to find support in an optimal inflation tax higher than the Friedman rule as they could not meet the condition that the binding loan constraint for welfare-maximization be smaller than the binding loan constraint for inflation-minimization according to their proposition 7.

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