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The marginal welfare cost of capital taxation: Discounting matters

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ABSTRACT

We interpret the marginal welfare cost of capital income taxes as the present discounted value of consumption distortions. Such an asset market interpretation emphasizes the importance of the interest rate used to value future distortions, especially in the presence of uncertainty. We find that the interest rate decreases as the tax rate increases, thus increasing the welfare cost. The variations in the interest rate are caused by amplified responses of consumption to exogenous shocks as a result of capital taxation. The welfare cost may be underestimated if variations in interest rates are ignored, especially when tax rates are high.

1. Introduction

In this paper we interpret the marginal welfare cost of capital income taxes as the present discounted value of consumption distortions. Just like prices of any other risky securities, the marginal welfare cost of taxes is determined by three factors: the stream of consumption distortions caused by inefficient allocation of resources, the covariance between consumption distortions and systematic risk, and the interest rate used to discount the stream of consumption distortions. Although the first two factors have been analyzed in the previous literature, including Lucas (1990) and Gordon and Wilson (1989), the impact of changes in capital income taxes on the interest rate has been ignored. We find that the interest rate used to discount future distortions decreases as the capital income tax rate increases, thus increasing the welfare cost of taxes. Our work brings to the forefront the importance of the interest rate used to value future consumption distortions. The welfare cost may be underestimated if variations in risky discount rates are ignored, especially when aggregate uncertainty is significant and tax rates are high.

We study the welfare cost of taxes in a general equilibrium production economy with varying degrees of uncertainty. We find that the marginal welfare cost of capital income taxes increases with the tax rate in both deterministic and stochastic environments. Moreover, the marginal welfare cost is larger in a stochastic than in a deterministic environment, and the gap widens as the tax rate increases. In the deterministic case, the upward slope of the marginal welfare cost curve is mostly driven by increasing consumption distortions as the tax rate increases. In the stochastic case, however, variations

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in the interest rate and in the covariance between consumption distortions and systematic risk also play important roles. We denote consumption distortions, variations in the interest rate and variations in the covariance term as the distortion, discounting and insurance effects of capital income taxes, respectively. The discounting and insurance effects that capture the variations in the interest rate and in the covariance term are unique for a stochastic environment.

The discounting effect is the core reason for the widening gap between marginal welfare costs in the stochastic and deterministic environments. As the tax rate increases, the discounting effect increasingly dominates the insurance effect, thus reducing the interest rate used to discount future distortions and raising the welfare cost. The intuition for the increasingly dominant discounting effect is as follows. As the capital income tax rate increases, investment is further discouraged. As a result, investment constitutes an increasingly smaller share of aggregate output in the steady state. A lower investment-output ratio implies that investment needs to respond more to exogenous shocks in order to smooth consumption, which now constitutes a larger fraction of output. Santoro and Wei (2011) show that such a mechanism can be responsible for increasingly amplified responses of consumption, and consequently of the marginal utility of consumption, to aggregate technology shocks. The amplified responses of the marginal utility of consumption typically lead to precautionary motives, which tend to reduce the interest rate used to value future consumption distortions.

In addition to the degree of aggregate uncertainty, the marginal welfare cost of capital income taxes depends on the preference and production specifications. Since we use an asset market approach to price consumption distortions, it seems important to have a production-based model that is not only able to mimic some basic asset pricing features but also tractable enough to make transparent the mechanisms introduced by capital income taxes. Jermann (1998) and Boldrin et al. (2001) show that the key ingredients for such a model are habit formation in preferences and adjustment costs in production technology. Based on this consideration, we assume moderately high habit persistence and capital adjustment costs in the benchmark parameterization. We also conduct a sensitivity analysis in the same stochastic environment but with varying degrees of habit persistence and capital adjustment costs.[1] We find that the discounting effect remains important just as in the benchmark case, resulting in a higher welfare cost in the stochastic environment.

Our findings can be related to those of Chamley (1981) and Lucas (1990), which use a deterministic dynamic general equilibrium model to evaluate the welfare gain obtained by abolishing the capital income tax. Since tax reforms typically involve discrete changes in tax rates rather than abolition of a tax, we focus specifically on the welfare cost of a marginal shift in the capital income tax rate, and integrate the marginal welfare cost over the given range of tax rates to compute the total gain from discrete changes in tax rates. Our calculation yields an overall welfare gain from abolishing capital income taxes that is at the high end of Lucas's estimate. The impact of capital income taxes on the interest rate, which is absent in a deterministic setting, contributes to the higher welfare cost of capital income taxes in the presence of aggregate uncertainty.

Judd (1987) examines the marginal efficiency cost of various factor taxes in a deterministic model. He states that "any biases of the deterministic approach relative to a more realistic model with uncertainty must arise from decreasing returns in capital intensity and third-order properties of utility functions". We find that it is precisely the omission of the effect of capital income taxes on the interest rate that biases the estimate of the deterministic approach, and this effect is closely related to the third-order properties of the utility function.

Our results advance the insights gained from Gordon and Wilson (1989), which examines the marginal welfare loss of capital taxation in a stochastic production economy similar to ours.[2] They argue that past measures that ignore the negative covariance between consumption distortions and the stochastic discount factor "likely overstate the efficiency costs of a rise in the tax rate, perhaps dramatically." The negative covariance stressed by Gordon and Wilson (1989) is also present in our framework. However, since Gordon and Wilson (1989) only examine the marginal welfare loss at a single tax rate, they do not study the declines in the interest rate accompanied by increases in the capital income tax rates. We find that the declines in the interest rate are significant enough to dominate the increasingly negative covariance as the tax rate increases.

We organize the paper as follows. In Section 2, we describe the production economy and derive our measure of the marginal welfare cost of capital income taxes. In Section 3, we use the production economy model to examine the properties of the marginal welfare cost curves, and decompose the marginal welfare cost to analyze the distortion, discounting and insurance effects separately. Section 4 describes the sensitivity analysis. Section 5 concludes.

2. A stochastic production economy

In this section, we describe a model that features a stochastic production economy, and then derive the market value of consumption distortions as a measure of the marginal welfare cost of capital income taxes.

There is a continuum of infinitely lived identical households that own a representative firm. The government levies taxes on capital income and rebates them back in a lump sum to the households. The economy grows at a constant rate g.

[1] The risk-free interest rate can be overly volatile in models such as Jermann (1998) and Boldrin et al. (2001). One purpose of the sensitivity analysis is to examine the robustness of our mechanism when the marginal rates of substitution, and also the risk-free rates, are less volatile.

[2] Bulow and Summers (1984) and Gordon (1985) also study the welfare cost of taxing risky capital income. An important limitation of their work is that they both employ a two-period framework, which alters the risk characteristics of any long-lived securities.