

The Welfare Cost of Capital Income Taxes under Uncertainty¹

Marika Santoro^a Chao Wei^b

^aCongressional Budget Office, Macroeconomic Analysis Division, Ford House Office Building, Washington, D.C. 20515

^bDepartment of Economics, George Washington University, 2115 G Street, N.W. Washington, D.C. 20052 &

Congressional Budget Office, Macroeconomic Analysis Division, Ford House Office Building, Washington, D.C. 20515

December 28, 2010

(Preliminary and Incomplete. Please do not cite without permission.)

Abstract

We construct a novel measure of the marginal welfare cost of capital income taxes in the presence of uncertainty. This measure has an asset pricing interpretation as the normalized present discounted value of consumption distortions from capital income taxes. Such an interpretation brings to the forefront the importance of the discount rate used to value future consumption distortions. We find that the discount rate decreases as the capital income tax rate increases, thus increasing the welfare cost of taxes. Higher levels of capital income taxation reduce the discount rate by amplifying the responsiveness of consumption to exogenous shocks. We find that the welfare cost may be underestimated if variations in the risky discount rates are ignored, especially when tax rates are high.

¹We would like to thank Michael Golosov, Jonathan Huntley, Larry Ozanne, and William Randolph for helpful comments and suggestions. All remaining errors are our own. Chao Wei is currently a visiting scholar at the Congressional Budget Office. The views expressed in this paper are those of the authors and should not be interpreted as those of the Congressional Budget Office.

1 Introduction

This paper studies the determinants of the marginal welfare cost of capital income taxes in a dynamic stochastic general equilibrium model. Starting from a balanced-growth equilibrium consistent with any arbitrarily given capital income tax rate, we examine the welfare cost of a permanent shift to a marginally higher tax rate despite a lump-sum full rebate of tax revenues. We measure the welfare cost of taxes as the compensation required to make the representative household indifferent between consumption plans with and without the marginal shift in tax rates. We relate this measure of welfare cost to the market value of a security, which is a claim to consumption distortions due to the marginal shift in tax rates. Such an interpretation brings to the forefront the importance of the discount rate used to value future consumption distortions. We find that the discount rate decreases as the capital income tax rate increases, thus increasing the welfare cost of taxes. The variations in the discount rate are caused by amplified responses of consumption to exogenous shocks as a result of capital income taxation. We find that the welfare cost may be underestimated if variations in the risky discount rates are ignored, especially when tax rates are high.

The interpretation of the marginal welfare cost as the market value of a security allows us to examine the welfare cost from an asset market perspective. Just like prices of any other risky securities, the marginal welfare cost of taxes is determined by three factors. The first factor is the stream of consumption distortion caused by inefficient allocation of resources. The second factor is the discount rate used to discount the stream of consumption distortions. The third factor is the covariance between consumption distortions and systematic risk. Desirable cyclical properties of consumption distortions may act as insurance and reduce the welfare cost of taxes.

We use a stylized real business cycle model with varying degree of uncertainty as our laboratory. We show that the marginal welfare cost of capital income taxes increases with the tax rate in both deterministic and stochastic economies. In a deterministic economy, the upward slope of the marginal welfare cost curve is mostly driven by increasing consumption distortions as the tax rate increases. In a stochastic economy, however, variations in the discount rate and the covariance term also play important roles. We find that, as the tax rate increases, the discount rate used to value future consumption distortions tends to decrease. Such variations of the discount rate can be explained by increasingly amplified responses of consumption to

exogenous shocks due to increases in capital income tax rates. The amplification mechanism is described in a recent paper by Santoro and Wei (2010). These amplified responses may cause variations in the discount rate and alter the magnitude of the covariance term. We find that the covariance term becomes increasingly negative as the capital income tax rate increases, thus mitigating the marginal welfare cost. However, the declines in the discount rate accompanied by increases in the capital income tax rate raises the marginal welfare cost. We find that the latter effect increasingly dominates as the capital income tax rate increases.

Since variations in the discount rate and the covariance term affect the shape of the marginal welfare cost in stochastic economies only, the increasingly dominant impact of the declining discount rate leads to a marginal welfare cost curve not only steeper than, but generally above that in a deterministic economy. We find that as the degree of uncertainty increases, the gap between the marginal welfare cost curves in deterministic and stochastic economies widens, reflecting the impact of uncertainty on the discount rate and the covariance term.

In addition to the degree of aggregate uncertainty, the marginal welfare cost of capital income taxes also depends on the preference and production specifications. A sensitivity analysis shows that the marginal welfare cost is significantly higher at all capital income tax rates when there exist both habit persistence and capital adjustment costs. This finding is consistent with Santoro and Wei (2010), which find that the impact of capital income taxes on asset prices is the strongest for this particular combination of preference and production specifications.

Our quantitative findings can be compared to Chamley (1981) and Lucas (1990), which use a deterministic dynamic general equilibrium model to evaluate the welfare gain obtained by the abolition of the capital income tax. According to Lucas (2003), "the overall welfare gains amount to perhaps 2 to 4 percent of annual consumption, in perpetuity." Since tax reforms typically involve discrete changes in tax rates rather than abolition of the tax, we focus specifically on the welfare cost of a marginal increase 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. We find that, using our measure, the overall welfare gain from abolishing capital income taxes is at the high end of Lucas' estimate in a standard dynamic general equilibrium setting. The impact of capital income taxes on the discount rate, which is absent in a deterministic setting, contributes to

the welfare cost of capital income taxes in presence of aggregate uncertainty. The contribution is small absent of habit persistence or capital adjustment costs, but can be markedly larger when these two features are present in preference and production specifications.

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 the decreasing returns to capital and third-order properties of utility functions are necessary for capital income taxes to have any effect on the discount rate. It is the omission of the possible effect of capital income taxes on the discount rate which biases the estimate of deterministic approach.

Our results modify the insights gained from Gordon and Wilson (1989), which examines the marginal welfare loss of capital taxation in a stochastic dynamic general equilibrium model close to ours.² They argue that past measures which 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 discount rate accompanied by increases in the capital income tax rates. We find that the declines in the discount rate are significant enough to dominate the increasingly negative covariance as the tax rate increases. In contrast to Gordon and Wilson (1989), when we consider the effects that uncertainty has on both the covariance term and the discount rate, we find that the deterministic approaches underestimate, rather than overestimate, the welfare cost of capital income taxes.

²Bulow 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.