Taxing Capital? Not a Bad Idea After All!

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September 18, 2012

Motivation

- Well-known Chamley-Judd result argues that capital income should not be taxed in the long run in complete markets setting.
- Since then, literature has identified two settings in which this result may not hold.
    1. If households face tight borrowing constraints and/or uninsurable idiosyncratic income risk, then optimal capital tax will generally be positive.
    2. In life-cycle models, the optimal capital income tax is generally different from zero if taxes cannot be conditioned on the age of the household.
- This paper seeks to determine how large the optimal capital tax actually is, in a realistically calibrated life-cycle model with ex-ante heterogeneity, borrowing constraints, and idiosyncratic income risk.

Preview of Results

- Optimal capital income tax is positive and substantial: $\tau_k = 0.36$.
- Optimal labor income tax is essentially a proportional 23% tax (after a deductible).
- Optimal tax policy welfare relative to no-capital-taxation baseline by improving distribution of consumption across agents.
- Individuals have a higher labor elasticity later in the life cycle, when their capital holdings are high.
- Capital taxation allows the planner to tax these agents without distorting their labor supply decision.

Demographics

- Discrete-time OLG model with J generations.
- Agents work up to year j_{ret}, and then retire.
- Mortality risk, with probability ψ_j of surviving from age j to $j+1$, $\psi_J = 0$.
- Unintended bequests are redistributed as lump-sum transfers TR_t across all living agents.

Endowments and Preferences

- Endogenous labor-leisure decision during working phase with a competitive labor market.
- Productivity during agent i's working phase is the product of a fixed effect α_i, a deterministic life-cycle component ε_j, and an idiosyncratic component $\eta_{i,t}$ following the stationary Markov chain Q.
- New households enter with average productivity $\bar{\eta}$ and no assets (aside from unintended bequests).

Technology and Market Structure

- Representative firm with Cobb-Douglas production function. Aggregate resource constraint given by

$$C_t + K_{t+1} - (1+\delta)K_t + G_t = Z_t K_t^{\alpha} N_t^{1-\alpha}.$$

- Incomplete markets: only asset is a risk-free one-period bond, denoted a, which pays interest rate r_t.
- Exogenous borrowing constraint restricts $a \geq 0$.

Government Policy

Spending Government faces a sequence of exogenous spending $\{G_t\}$ in excess of social security transfers.

Taxation Government can impose:

1. $\tau_{c,t}$: a proportional tax on consumption expenditures
2. $\tau_{K,t}$: a proportional tax on capital income.
3. $T(y_t)$: a possibly progressive tax on taxable labor income (labor income minus employer's share of payroll taxes).

Social Security Government pays identical, exogenously determined social security benefits SS_t to each household, financed by a proportional payroll tax $\tau_{ss,t}$ on labor income (up to a maximum level $\bar{y}$) that ensures period-by-period balance of the social security system.

Agent's Problem

Agent i's problem at age j and time t is:

$$V_{i,j,t}(a,\eta) = \max_{c,a',l} u(c, 1-l) + \beta\psi_j \int V_{i,j+1,t+1}(a',\eta')Q(\eta, d\eta')$$

subject to

$$\begin{aligned}
(1+\tau_{c,t})c + a' &= y_t^{pre} - \tau_{ss,t}\min\{y_t^{pre}, \bar{y}\} + (1 + r_t(1-\tau_{K,t}))(a + TR_t) \\
&\quad - T_t(y_t) \\
y_t^{pre} &= w_t\alpha_i\varepsilon_j\eta l \\
y_t &= y_t^{pre} - \frac{1}{2}\tau_{ss,t}\min\{y_t^{pre}, \bar{y}\}
\end{aligned}$$

for $j < j_{ret}$, and

$$(1+\tau_{c,t})c + a' = SS_t + (1 + r_t(1-\tau_{K,t}))(a + TR_t)$$

for $j \geq j_{ret}$.

Competitive Equilibrium

Given a sequence of government expenditures $\{G_t\}$, consumption tax rates $\{\tau_{c,t}\}$, and initial conditions K_1 and Φ_1, a competitive equilibrium is a sequence of functions (V_t, c_t, a'_t, l_t), production plans $\{N_t, K_t\}$, government tax policy $\{T_t(\cdot), \tau_{K,t}\}$, social security policy $\{SS_t, \tau_{ss,t}\}$, prices $\{w_t, r_t\}$, transfers $\{TR_t\}$, and measures $\{\Phi_t\}$ such that:

1. Given prices, the (c_t, a'_t, l_t) solve the household's problem and V_t is the associated value function.
2. Given prices $\{N_t, K_t\}$ solve the representative firm's problem.
3. The social security budget is balanced.
4. Bequests are distributed evenly to all living agents.
5. The government's budget is balanced.
6. The capital, labor, and aggregate resource markets clear.
7. The law of motion over measures is consistent with aggregation of agent behavior.

Stationary Equilibrium

- A stationary equilibrium is a competitive equilibrium in which per capita variables and functions (V, c, a', l), as well as prices (w, r) and policies $(\tau_k, T(\cdot), \tau_{ss}, SS)$, are constant, and aggregate variables (G_t, N_t, K_t, TR_t) grow at the constant growth rate of population n.

Calibration and Functional Forms

- Cobb-Douglas utility:

$$u(c, 1-l) = \frac{\left(c^{\gamma}(1-l)^{1-\gamma}\right)^{1-\sigma}}{1-\sigma}$$

- Labor productivity process: $\log(\eta)$ is an $AR(1)$, $\alpha_i \in \{\alpha_L, \alpha_H\}$.
- Key parameters: $\beta = 1.001$, $\sigma = 4$, $\gamma = 0.377$, $\tau_c = 0.05$.

Gouveia-Strauss Taxes

- Constrain the optimal income tax function to fall in the Gouveia-Strauss family

$$T^{GS}(y;\kappa_0,\kappa_1,\kappa_2)=\kappa_0\left(y-\left(y^{-\kappa_1}+\kappa_2\right)^{1/\kappa_1}\right).$$

- κ_0 controls the average tax rate, κ_1 determines progressivity, κ_2 is like a deduction.
- Given (κ_0,κ_1), κ_2 is pinned down by balanced budget constraint.
- Tax function is more progressive as $\kappa_1\to 0^+$, flatter as $\kappa_1\to\infty$.

Optimal Taxation Problem

- Government chooses $(\kappa_0, \kappa_1, \tau_k)$ to maximizes the social welfare function of expected ex-ante utility of a newborn agent under stationary equilibrium:

$$SWF(\kappa_0, \kappa_1, \tau_k) = \mathbb{E}_0 \left[V_{i1}(a = 0, \eta = \bar{\eta}; \kappa_0, \kappa_1, \tau_k) \right]$$

- Baseline tax policy: $\tau_k = 0, \kappa_0 = 0.258, \kappa_1 = 0.768$, where (κ_0, κ_1) are chosen to match current US tax policy.

Optimal Tax System

- Optimal tax system sets $\tau_k = 0.36$, and sets $\kappa_0 = 0.23$, $\kappa_1 \simeq 7$ (essentially a 23% flat labor tax).
- Effect of tax is to reduce aggregate hours worked (-0.56%), labor supply (-0.11%), capital stock (-6.64%), output (-2.51%), and consumption (-1.63%) relative to zero capital taxation calibration.
- Welfare effects calculated using consumption equivalent variation (CEV): the change in permanent consumption under the old equilibrium that delivers the same expected lifetime utility as the new equilibrium.
- CEV increases under the optimal tax by 1.33% relative to the baseline.

Optimal Tax System

- Most of the effect of the tax is actually from improving the distribution of consumption across agents, which increases CEV by 2.97%.
- This more than offsets the negative effect on the average level of consumption, which reduces CEV by 1.63%.
- Effect of change in labor supply on CEV is small, as level of leisure goes up, but distribution actually gets worse.

Interpretation

- To decompose effects, rerun the model with various components shut down.
- Under inelastic labor supply find no robust case for positive capital income taxes if the government has access to progressive labor taxes, even with ex-ante heterogeneity, idiosyncratic risk and tight borrowing constraints.
- With endogenous labor supply and no life cycle, optimal $\tau_k = 0.2$, even without ex-ante heterogeneity, idiosyncratic risk, or borrowing constraints.
- Adding life-cycle productivity yields $\tau_k = 0.34$ at the optimum, essentially identical to the full model.
- Intuition: other sources of inequality are better dealt with through adjustments to the labor income tax.

Capital Taxation and Labor Supply

- Why do endogenous labor supply and life-cycle productivity changes imply positive capital taxes?
- Equilibrium with elastic labor supply satisfies the intertemporal condition
$$\frac{\phi U_{l,1}}{U_{l,2}} = \beta(1 + r(1 - \tau_k))\frac{(1 - \tau_{l,1})}{(1 - \tau_{l,2})}$$
where ϕ is Frisch labor supply elasticity.
- Therefore, a positive capital income tax is equivalent to a *falling* labor income tax with age.
- This is desirable when life-cycle characteristics imply a falling labor supply profile and rising labor supply elasticity.
- Similar effect could be obtained by explicitly conditioning taxes on age, but this not available to the planner.

Conclusion

- Endogenous labor supply with increasing elasticity over the life cycle leads to positive capital taxation.
- Future research should focus on detailed modelling of institutions affecting life-cycle labor supply and savings incentives, especially Social Security and Medicare in the US.