Taxing Capital? Not a Bad Idea After All!
Authors: Juan Carlos Conesa, Sagiri Kitao, and Dirk Krueger

Presentation: Dan Greenwald

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 $\psi_j$ 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 $\alpha_i$, a deterministic life-cycle component $\varepsilon_j$, 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

$$(1 + \tau_{c,t})c + a' = y_{t}^{pre} - \tau_{ss,t} \min \{y_{t}^{pre}, \bar{y}\} + (1 + r_t(1 - \tau_{K,t}))(a + TR_t) - T_t(y_t)$$

$$y_{t}^{pre} = w_t \alpha_i \varepsilon_j \eta l$$

$$y_t = y_{t}^{pre} - \frac{1}{2} \tau_{ss,t} \min \{y_{t}^{pre}, \bar{y}\}$$

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 $\Phi_1$, 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.
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 \(n\).
Cobb-Douglas utility:

\[ u(c, 1 - l) = \frac{(c^\gamma(1 - l)^{1-\gamma})^{1-\sigma}}{1 - \sigma} \]

Labor productivity process: \( \log(\eta) \) is an AR(1), \( \alpha_i \in \{\alpha_L, \alpha_H\} \).

Key parameters: \( \beta = 1.001, \sigma = 4, \gamma = 0.377, \tau_c = 0.05 \).
Constrain the optimal income tax function to fall in the Gouveia-Strauss family

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

- \( \kappa_0 \) controls the average tax rate, \( \kappa_1 \) determines progressivity, \( \kappa_2 \) is like a deduction.
- Given \( (\kappa_0, \kappa_1) \), \( \kappa_2 \) is pinned down by balanced budget constraint.
- Tax function is more progressive as \( \kappa_1 \to 0^+ \), flatter as \( \kappa_1 \to \infty \).
Government chooses \((\kappa_0, \kappa_1, \tau_k)\) to maximize the social welfare function of expected ex-ante utility of a newborn agent under stationary equilibrium:

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

Baseline tax policy: \(\tau_k = 0, \kappa_0 = 0.258, \kappa_1 = 0.768\), where \((\kappa_0, \kappa_1)\) are chosen to match current US tax policy.
Optimal Tax System

- Optimal tax system sets $\tau_k = 0.36$, and sets $\kappa_0 = 0.23$, $\kappa_1 \approx 7$ (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 \( \phi \) 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.