Should We Tax Capital Income or Wealth?

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August 18, 2024

Preliminary – Neither cite nor distribute this paper

Latest draft can be found in this link

Abstract

The answer is: we should tax capital income. This conclusion is derived by analyzing taxes on capital income and wealth in a Merton-Samuelson multiple-period portfolio model with safe and risky assets, where risk may either be idiosyncratic or aggregate risk. Tax reforms are analyzed where taxes on capital income are increased, while taxes on wealth are decreased, such that the net intertemporal price of consumption remains constant. These tax reforms are found to be welfare improving, because taxes on capital income impose a non-distorting tax on the risk-premium, whereas taxes on wealth do not. Furthermore, such tax reforms promote risk-taking via the Domar-Musgrave effect, while keeping intertemporal distortions and savings constant. Hence, for the same distortions, taxes on capital income generate more revenue than taxes on wealth. This is unambiguously welfare improving with idiosyncratic risk and also welfare improving with aggregate risk if public goods provision is not too inefficiently large. Optimal taxes on capital income and wealth are derived. Taxes on capital income are used to tax the risk premium, while (negative) taxes on wealth should ensure intertemporal efficiency, which would boil down to a tax a rate of return allowance, joint with a tax on capital income.

1 Introduction

Should capital income or wealth be taxed? Recently, proposals for taxing wealth have recently greatly gained prominence, see for example, Scheuer and Slemrod (2021), and Guvenen et al. (2023). These proposals go against an historically strong preference, shared by many public-finance economists, that capital income taxes should be preferred over wealth taxes, see for example Bastani and Waldenström (2020), Boadway and Pestieau (2023), Abdel-Kader and De Mooij (2020), and Cnossen and Jacobs (2021).[1]

This paper aims to answer the question: should capital income taxes be preferred over wealth taxes? Despite the obvious relevance of this question, to the best of our knowledge, no paper in the public-finance literature has systematically analyzed the fundamental differences between taxes on capital income and wealth in the basic dynamic stochastic portfolio-choice model of Merton (1969) and Samuelson (1969). It is perhaps surprising that nearly half a century passed since these Nobel-prize-winning contributions and still no such analysis exists.[2]

[1] A good case can be made for levying wealth taxes if no capital income taxes can be levied, for example because taxes on capital income are lacking (as in the Netherlands), or capital gains are realization-based and the very wealthy indefinitely postpone capital-gains realization (the 'Warren Buffet problem).

[2] To be sure, the literature has given many informal discussions as the papers mentioned above demonstrate. Moreover, it contains a lot of important results that have a bearing on this question, as will be explained later. But their main differences have not yet been formally analyzed. That is where the current paper aims to contribute.

To answer this paper's question – should capital income taxes be preferred over wealth taxes? – we analyze wealth and capital income taxation in the dynamic stochastic Merton–Samuelson model of optimal consumption and portfolio choice, where taxes on capital income are meaningfully different from taxes on wealth due to the presence of risk in asset returns. In each period, individuals make a saving and a portfolio choice. Individuals can choose their savings in the form of safe assets (bonds) and risky assets (equities). We study the cases in which the risky asset only feature sidiosyncratic risk or only aggregrate risk. The former case corresponds more to risks in non-tradable assets, such as shares in proprietorships or closely-held firms. The latter case corresponds to risks on shares that are traded in stock markets. We allow the government to deploy both capital income and wealth taxes. Wealth taxes can be ex ante (the tax base excludes risky returns on assets) and ex post (the tax base includes risky returns on assets). Moreover, we allow the government to provide riskless income transfers that are independent from the state of the economy or to provide risky public goods whose level depends on stochastic tax revenue (if aggregate risks are considered).

To answer the question whether taxes on capital income are better than taxes on wealth, we analyze a perturbation of a pre-existing tax system in which there are taxes on both wealth and capital income. The perturbation entails an increase in the tax on capital income and a reduction in the tax on wealth such that the safe after tax rate of return remains constant, i.e., the intertemporal price of consumption remains fixed. As a result, consumption and saving choices do not change. Moreover, the comparative statics of the portfolio response to the tax reform are very sharp due to the Domar-Musgrave effect; individuals choose the same combination of net-returns and risk before and after the tax reform. Hence, the elasticity of the share of risky assets with respect to the tax on capital income is unity. Hence, all comparative statics are clearly defined. Finally, we derive dynamic-stochastic Roy's identities to evaluate the effects of wealth and capital income taxes on expected utility.

We then show that taxes on capital income are superior over taxes on wealth. This holds true both if risk in asset returns is ideosyncratic or aggregate. However, in the latter case, taxes on capital income need to be below the optimal tax on capital income. Under the proposed tax reform that keeps the intertemporal price of consumption fixed, the capital income tax yields more tax revenue than the tax on wealth for the same intertemporal distortions. Intuitively, the tax base is shifted from a more (wealth) to a less distortionary part of the capital tax base (risk premium). In addition, the tax reform encourages risk-taking, which always yields additional tax revenue due to the inclusion of the risk-premium in the tax base.

This main intuition for our findings can already be understood with the following stylized example. Suppose that housholds own just one asset a with a stochastic return $r(\theta)$, which depends on the state of the world θ. Total realized capital income is $r(\theta)a$. Ex ante, expected return on capital income is $\mathrm{E}(r(\theta))$, and the variance is $\sigma = (r - \mathrm{E}(r(\theta)))^2$. The capital income tax is τ^I and the (ex ante) wealth tax is τ^A. The mean and variance of net capital income under a capital income tax are $(1-\tau^I)\mathrm{E}(r(\theta))a$ and $(1-\tau^I)^2a^2\sigma$. The capital income tax both reduces the mean net return and the variance of the mean net returns. The mean and variance of expected net capital income under a wealth tax are $(\mathrm{E}(r(\theta)) - \tau^A)a$ and $a^2\sigma$. Hence, the wealth tax reduces the mean net return, but it does *not* reduce the variance in capital income.

The reason why capital income taxes should be preferred over wealth taxes is that for the same distortion of the expected return, they give a lower variance in capital income. Hence, the capital income tax should be welfare-preferred over the wealth tax. The mirror image of the better insurance properties is that the tax on capital income generates more revenue from taxing the risk-premium on risky assets, which is non-distortionary, both if risks are idiosyncratic and systematic. If we define the risk premium as $\pi \equiv \mathrm{E}(r(\theta)) - \rho$, then the difference between the revenue of a capital income tax with the same effective tax on the safe return as a wealth tax is: $\tau^I \pi a$.[3] Hence, the wealth tax excludes the risk-premium from the tax base, from which the desirable properties of the tax on capital income derive.

Next to deriving compensated tax reforms, we study the optimal tax on capital income and wealth. We find that optimal capital income taxes are always positive (under aggregate risk) and may increase to 100 percent (under idiosyncratic risk). This paper shows that the main role of the wealth tax should be to eliminate intertemporal distortions from capital income taxes, given that the safe return to saving should optimally not be taxed in the baseline of our model. Consequently, optimal tax policy entails an allowance for the safe rate-of-return. This efficiency role of the wealth tax may disappear if the optimal tax on the safe return to capital should be positive.

This paper thus demonstrates that the recent literature with a strong focus on wealth taxes may lead policy makers astray. Indeed, this paper provides support to the traditionally strong preference of public finance economists to tax capital income, and not wealth. Therefore, one may need to resort to other reasons why taxing wealth over taxing capital income may be desirable. Capital market imperfections may result in pre-existing distortions which might be alleviated better with wealth taxes, although the literature has not settled down on this issue (Guvenen et al., 2023; Boar and Midrigan, 2023; Guvenen et al., 2024). Moreover, lock-in effects in taxing capital gains may also make wealth taxes desirable as a second-best instrument to tax capital if taxes on capital gains are hard to implement (Saez, Yagan, and Zucman, 2021; Schelderup and Zoutman, 2024).

Furthermore, an often-used argument in popular discussions is that a wealth tax is not such a bad policy compared to a capital income tax, because accumulated wealth can be interpreted as capital incomes earned in the past. As a result, a tax on wealth – especially when levied in the more distant future – will resemble more and more a tax on capital income. By analyzing an investor with a long investment horizon, this paper shows that a wealth tax does not converge to a capital income tax even in the long run. Intuitively, the relative gains of taxing capital income over taxing wealth increase proportionately in the investor's stock of wealth. Hence, the relative gains of taxing capital income grow as wealth increases.

This paper is structured as follows. Section 2 discusses related literature. Section 3 sets up the model. Section 4 presents the main findings. Section 5 analyzes optimal taxes. Section 6 concludes. An appendix contains some proofs of Propositions and Lemmas.

[3] An ex post tax on wealth, which includes the risky returns in the tax base, is also able to provide income insurance by taxing the risk premium, but for the same distortions in saving, both insurance and revenue will still be less than with the tax on capital income, since assets are still included in the tax base and not only risky capital income. Intuitively, the capital income tax gets closer to taxing the risk premium than the ex post wealth tax. By better shifting the tax burden to the non-distortionary parts of the tax base, a capital income tax is therefore preferred over an ex post wealth tax.

2 Related literature

- Domar and Musgrave (1944), Stiglitz (1969), Sandmo (1977), Atkinson and Stiglitz (1980)
- Gordon (1985), Kaplow (1994)
- Christiansen (1993), Schindler (2008), Boadway and Spiritus (2024)
- Guvenen et al. (2023), Gerritsen et al. (2023), Boar and Midrigan (2023), Guvenen et al. (2024)
- Saez, Yagan, and Zucman (2021), Schelderup and Zoutman (2024)

3 Model

We introduce taxes on capital income and wealth in the completely standard dynamic portfolio-choice models due to Merton (1969) and Samuelson (1969). To the best of our knowledge this has not been done before.

We follow the discrete-time formulation of Samuelson (1969). A representative individual lives for $t = 0, \cdots, T$ periods, where T can potentially be be very large.[4] In each period, the state of the world is denoted by $\theta_t \in \Theta_t \equiv (-\infty, \infty)$. θ_t is not known ex ante. $\theta^t \equiv [\theta_0, \theta_1, \cdots, \theta_t]$ denotes the history of realized states θ up until t. $p(\theta_t)$ is the probability that state θ_t occurs in period t. Similarly, $p(\theta^t)$ is the probability that state sequence θ^t occurs. The derivations allow for any intertemporal correlation of states. Hence, we do not need to assume that the states are independently distributed over time, i.e., where $p(\theta^t) = p(\theta_0)p(\theta_1)...p(\theta_t)$. For notational simplicity, the dependence of all model variables – including all policy variables – on the state history θ^t is suppressed. Individuals have rational expectations, where the expectations operator over any variable x_{t+1} as of time t is defined as $\mathrm{E}_t[x_{t+1}] \equiv \sum_{\Theta_{t+1}} x_{t+1} p(\theta_{t+1})$.

3.1 Households

A representative individual maximizes expected utility U, which is the expected discounted flow of sub-utilities from consumption c_t and public goods G_t in each year t:

$$U \equiv \mathrm{E}_0 \sum_{t=0}^{T} \frac{u(c_t) + \Gamma(G_t)}{(1+\beta)^t}, \quad u', \Gamma' > 0, \quad u'', \Gamma'' < 0, \quad u''' \geq 0, \quad \beta > 0, \tag{1}$$

where β is the individual's rate of time preference. The sub-utility functions $u(c_t)$ and $\Gamma(G_t)$ are strictly concave.[5] We allow for potentially state-dependent public good provision, as in Christiansen (1993), Schindler (2008), and Boadway and Spiritus (2024), so that public goods can be employed to (partly) insure against aggregate risk. Utility is time-separable, as is completely standard in the literature. Therefore, we can solve for optimal savings and portfolio choices using standard dynamic programming techniques. Public goods are assumed to be

[4] We conjecture that all our results extend to the infinite-horizon case.
[5] There is no bequest motive. In an extension, we allow for this, but the main insights do not change.

separable in utility from private goods to avoid complicated second-best interactions between public-good provision, saving and risk-taking.

As regards the revelation of uncertainty, the household learns the state of the world θ_t at the beginning of each period t. The household then conditions saving and portfolio decisions of perod t on this observed state. However, public goods provision may adjust after the realization of the state θ_t if there is aggregate risk. The model is partial equilibrium and asset returns are exogenously given.

In each period, the individual earns exogenous labor income y_t. The individual can invest in risk-free government bonds b_t with a time-invariant fixed rate of return ρ or in risky stocks of firms e_t, which have a potentially time-varying stochastic rate of return $r_t(\theta_t)$, which depends on the state of the economy θ_t. θ_t may reflect stock market risk, individual investment risk, or excess returns. In the worst possible state of the economy, the individual loses the entire value of the risky asset ($r(-\infty) \equiv -1$), while in the best possible state of the economy the risky asset has a potentially unbounded return ($r(\infty) \equiv \infty$). τ_t^I is the linear tax rate on capital income and τ_t^A is the linear (ex ante) wealth tax.

Total assets are denoted by $a_t \equiv b_t + e_t$. Initial assets are exogenously given ($a_0 > 0$) and terminal assets are zero ($a_T = 0$). The portfolio share of equities in total assets is denoted by $\omega_t \equiv e_t/a_t$, and the corresponding share of bonds is $1 - \omega_t \equiv b_t/a_t$. The period t budget constraint of the individual in each period t for each state θ_t can thus be written as:[6]

$$c_t = y_t + a_t - \frac{a_{t+1}}{R_t}, \tag{2}$$

where the net return factor is given by

$$R_t \equiv (1 + (1 - \tau_t^I)\rho)(1 - \omega_t) + (1 + (1 - \tau_t^I)r_t(\theta_t))\omega_t - \tau_t^A. \tag{3}$$

We solve the consumer's optimization problem using dynamic stochastic programming given that utility is time separable. In particular, let $\mathcal{V}_t(a_t)$ be the value function at time t of total assets a_t:

$$\mathcal{V}_t(a_t) \equiv \max_{\{c_t,\omega_t\}} \mathrm{E}_t \sum_{s=t}^{T} \frac{u(c_s) + \Gamma(G_s)}{(1+\beta)^s}, \tag{4}$$

where $\max_{\{c_t,\omega_t\}}$ indicates that consumption c_t and portfolio weights ω_t are all chosen such that expected utility from $s = t$ onwards is maximized. For any period t, we have the following Bellman recursion – see Appendix:

$$\mathcal{V}_t(a_t) \equiv \max_{c_t,\omega_t} u(c_t) + \mathrm{E}_t[\Gamma(G_t)] + \frac{1}{(1+\beta)} \mathrm{E}_t[\mathcal{V}_{t+1}((y_t + a_t - c_t)R_t)]. \tag{5}$$

Note that consumption at date t is deterministic, but public goods provision may depend on the realization of each state θ_t in the presence of aggregate risk. Consequently, one needs to take the expectation over public goods provision as of time t.

Maximization of expected utility yields the following first-order conditions for optimal con-

[6] Like Samuelson (1969), we avoid some notational complexity by harmlessly assuming that consumption takes place at the end rather than at the beginning of each period.

sumption and portfolio choices for each period t:

$$u'(c_t) = \frac{1}{(1+\beta)} \mathrm{E}_t[\mathcal{V}'_{t+1}(\cdot)R_t], \tag{6}$$

$$\mathrm{E}_t[\mathcal{V}'_{t+1}(\cdot)(y_t + a_t - c_t)(1-\tau_t^I)(r_t(\theta_t) - \rho)] = 0. \tag{7}$$

Equation (6) is the standard, stochastic Euler equation for consumption. Taxes on capital income and wealth may both distort saving choices. Equation (7) gives the standard optimality condition for the share of wealth that is invested in risky assets. Let the risk-premium on equities in year t be defined as $\pi_t \equiv -\frac{\mathrm{cov}[r_t(\theta_t),\mathcal{V}'_{t+1}(\cdot)]}{\mathrm{E}[\mathcal{V}'_{t+1}(\cdot)]}$, then equation (7) for optimal portfolio choice can be written as:

$$\mathrm{E}_t[r_t(\theta_t)] = \rho + \pi_t. \tag{8}$$

From this follows that optimal portfolio choice follows standard CAPM-logic: the expected return on risky assets are equal to the safe rate plus the risk premium. Portfolio choices are neither distorted by the tax on capital income nor by the tax on wealth. Intuitively, both tax instruments affect risk-free and risk-bearing assets symmetrically, so that the optimal degree of risk taking is not distorted by taxation.[7]

These first-order conditions give the optimal policy rules for consumption c_t^* and ω_t^* at each time t that depend on the entire history of shocks θ^{t-1} up until $t-1$:

$$c_t^* \equiv c(a_t, \theta^{t-1}), \quad \omega_t^* \equiv \omega(a_t, \theta^{t-1}). \tag{9}$$

If the shocks θ_t are independently distributed over time, the policy rules are (time-dependent) functions only of the stock of wealth a_t at time t:

$$c_t^* \equiv c_t(a_t), \quad \omega_t^* \equiv \omega_t(a_t). \tag{10}$$

The value function $\mathcal{V}_t(a_t)$ is closely related to the indirect utility function. In particular, the indirect utility function is given by:

$$U = \mathcal{V}_0(a_0) \equiv \max_{\{c_t,\omega_t\}} \mathrm{E}_t \sum_{s=0}^{T} \frac{u(c_s) + \Gamma(G_s)}{(1+\beta)^s}. \tag{11}$$

where consumption c_t and protfolio weights ω_t are all chosen such that expected utility from $s = 0$ onwards is maximized. Therefore, we can derive a dynamic stochastic version of Roy's identity to find the derivatives of the value function with respect to all relevant tax policy variables, as shown in the next Lemma.

Lemma 1 (Dynamic-stochastic Roy's identity) *The period-t recursion of the Bellman equation has the following partial derivatives for all t:*

$$\frac{\partial \mathcal{V}_t(a_t)}{\partial a_t} = \frac{1}{(1+\beta)} \mathrm{E}_t[\mathcal{V}'_{t+1}(.)R_t] = u'(c_t), \tag{12}$$

[7]From Stiglitz (1969), Atkinson and Stiglitz (1980) and Sandmo (1985) follows that the optimal degree of risk taking is dependent on whether there are taxes on capital income or wealth. However, even though risk-taking is affected, it is not *distorted* because there is no wegde between social and private returns to risk-taking.

$$\frac{\partial \mathcal{V}_t(a_t)}{\partial \tau_t^I} = -\frac{\mathrm{E}_t[\mathcal{V}'_{t+1}(.)]}{(1+\beta)}(y_t + a_t - c_t)\rho, \tag{13}$$

$$\frac{\partial \mathcal{V}_t(a_t)}{\partial \tau_t^A} = -\frac{\mathrm{E}_t[\mathcal{V}'_{t+1}(.)]}{(1+\beta)}(y_t + a_t - c_t), \tag{14}$$

$$\frac{\partial \mathcal{V}_t(a_t)}{\partial G_t} = \Gamma'(G_t) f(\theta_t). \tag{15}$$

Proof See Appendix.

3.2 Government

The government collects taxes on capital income and wealth, it issues government debt d_t, and it provides public goods G_t, all at time t. Initial debt is given by d_0, while terminal debt is zero: $d_T = 0$. Hence, the government budget constraint for every t is given by:

$$d_{t+1} - d_t = \rho d_t + G_t - \tau_t^I(\rho + (r_t(\theta_t) - \rho)\omega_t)a_{t+1} - \tau_t^A a_{t+1}. \tag{16}$$

where $a_{t+1} = y_t + a_t - c_t$. The government can smooth aggregate risks intratemporally – by adjusting the level of public goods provision – and intertemporally – by adjusting government debt. From the government budget constraint follows that the base of the capital income tax is the safe rate of return on all assets ρa_{t+1} plus the risk premium on equities $(r_t(\theta_t) - \rho)\omega_t a_{t+1}$. Whereas the base of the (ex ante) wealth tax is given by total assets a_{t+1}. We rule out lump-sum taxes and taxes on labor earnings. The latter are also lump-sum taxes, since labor income is exogenous.

If the state θ_t is fully idiosyncratic, then the law of large numbers applies, and tax revenue becomes deterministic for all t:

$$d_{t+1} - d_t = \rho d_t + G_t - \tau_t^I(\rho + \pi_t\omega_t)a_{t+1} - \tau_t^A a_{t+1}. \tag{17}$$

From this follows that the tax base of the capital income tax is the normal return on all assets ρa_{t+1} plus the risk premium on equity $\pi_t\omega_t a_{t+1}$, and the tax base of the ex ante wealth tax is total assets a_{t+1}.

4 Tax reforms

To explore the desirability of capital income taxes over wealth taxes, a specific tax reform will be analyzed which has sharp comparative statics. In particular, we consider an exogenously given tax system with positive taxes on capital income and wealth, which does not need to be optimal. We consider the following policy reform: suppose we raise the capital income tax in year t with $\mathrm{d}\tau_t^I > 0$, and reduce the wealth tax in that same year with $\mathrm{d}\tau_t^A < 0$, such that the intertemporal price of consumption, i.e., the net, after-tax safe rate of return does not change. The following lemma provides the specifics of the tax reform studied in this paper.

Lemma 2 (Tax reform) *The net, after-tax safe rate of return is given by $(1-\tau_t^I)\rho - \tau_t^A$. Any reform of taxes on wealth and capital income that leaves the intertemporal price of consumption* *unaffected satisfies* $\mathrm{d}\tau_t^A = -\rho \mathrm{d}\tau_t^I$*.*

The main question that we aim to answer is whether a tax reform that raises the tax on capital income and lowers the tax on wealth raises utility or government revenue. If it does, then a tax on capital income is welfare superior to a tax on wealth.

4.1 Comparative statics

To sign the welfare effects of the tax reform in Lemma (2), we derive the comparative statics of saving and portfolio choice to this tax reform. These comparative statics are given in the next Lemma.

Lemma 3 (Comparative statics tax reform) *Consider an increase in the tax on capital income and a reduction in the tax on wealth in any period* t *such expected utility remains fixed:* $\mathrm{d}\tau_t^A = -\rho \mathrm{d}\tau_t^I$*. This tax reform has the following comparative statics:*

1. *The intertemporal price of consumption in period* t *does not change (*$\mathrm{d}((1+(1-\tau_t^I)\rho_t) - \tau_t^A) = 0$*),*

2. *Total saving and consumption choices in period* t *are not affected (*$\mathrm{d}(y_t + a_t - c_t) = 0$*),*

3. *The share of risky assets portfolio increases such that the same risk-return trade-off is obtained in period* t*:* $\frac{(1-\tau_t^I)}{\omega_t}\frac{\mathrm{d}\omega_t}{\mathrm{d}\tau_t^I} = 1$ *(Domar and Musgrave, 1944).*

The policy elasticities of saving and portfolio weights under the tax reform are then given by:

$$\varepsilon_{a\tau^I} \equiv -\frac{\mathrm{d}a_{t+1}}{\mathrm{d}\tau_t^I}\frac{(1-\tau_t^I)}{a_{t+1}} = 0, \quad \varepsilon_{\omega\tau^I} \equiv \frac{\mathrm{d}\omega_t}{\mathrm{d}\tau_t^I}\frac{(1-\tau_t^I)}{\omega_t} = 1. \tag{18}$$

Proof See Appendix.

The policy elasticities elasticities capture the behavioral response of saving and portfolio choice to the tax reform $\mathrm{d}\tau_t^A = -\rho \mathrm{d}\tau_t^I$. These elasticities are valid only under this particular tax reform. The intuition for the comparative statics in portfolio choice follows from Sandmo (1985). Individuals reshuffle their portfolio's by increasing the share of equities in response to the higher tax on capital income to obtain the same net-return-risk combination. That is why the elasticity of the portfolio share with respect to the tax on capital income is one. This is also referred to as the Domar and Musgrave (1944)-effect, see also Kaplow (1994) and Schindler (2008). Since the intertemporal price of consumption is not affected by the tax reform, the individual does not want to change intertemporal consumption behavior. Hence, saving and consumption choices are not affected. Indeed, if the consumer can achieve the same probability distribution of future consumption as before by a simple rearrangement of his portfolio, there is no reason why she should change his level of saving and, thereby, her consumption choices.

As a result, the comparative statics of the particular tax reform are very sharp and allow us to sign the welfare effects of the reform.[8]

Finally, note that the behavioral elasticities are independent from whether risk in capital income is idiosyncratic or aggregate. The reason is that we assumed separability between private and public consumption in utility.

4.2 Welfare effects tax reform – idiosyncratic risk

We will the effects of the tax reform in Lemma (2) under two different assumptions regarding risk in capital income: all risk is idiosyncratic or all risk is aggregate. In this section, we start with the simpler case in which all risk is idiosyncratic and government revenue is deterministic. Denote net government revenue (net debt reduction) as $\mathcal{R}_t \equiv (1+\rho)d_t - d_{t+1}$. The deterministic period-t government budget constraint in eq. (17) can then be rewritten as:

$$\mathcal{R}_t \equiv (1+\rho)d_t - d_{t+1} = \tau_t^I(\rho + \pi_t\omega_t)a_{t+1} + \tau_t^A a_{t+1} - G_t. \tag{19}$$

We will show that the tax reform of Lemma (2) keeps expected utility fixed. As a result, we can sign the total welfare effect of the tax reform by calculating the change in public resources $\mathrm{d}\mathcal{R}_t/\mathrm{d}\tau_t^I$. This welfare effect is identical to rebating the increase in public revenue as a deterministic lump-sum transfer to the consumer. This yields the first main proposition of the paper.

Proposition 1 (Superiority of taxes on capital income over taxes on wealth) *Starting from an initial tax system with positive taxes on capital income and on wealth, presuming that all risk in capital income is idiosyncratic, if the tax on capital income is raised, and the tax on wealth is lowered such that* $\mathrm{d}\tau_t^A = -\rho\mathrm{d}\tau_t^I$*, then social welfare in period* t *increases according to:*

$$\frac{\mathrm{d}\mathcal{R}_t/\mathrm{d}\tau_t^I}{a_{t+1}} = \pi_t\omega_t - \frac{(\tau_t^I(\rho+\pi_t\omega_t)+\tau_t^A)}{1-\tau_t^I}\varepsilon_{a\tau^I} + \frac{\tau_t^I}{1-\tau_t^I}\pi_t\omega_t\varepsilon_{\omega\tau^I} = \frac{\pi_t\omega_t}{1-\tau_t^I} > 0, \tag{20}$$

where the the elasticities follow from Lemma (3).

Proof See Appendix.

From Proposition (1) follows that taxes on capital income are to be preferred over taxes on wealth. The intuition is that a tax reform that raises the tax on capital income and lowers the tax on wealth implies a shift in the tax burden away from the safe rate of return towards the risk premium. This effect is captured by the first term in the right-hand side ($\pi_t\omega_t$). By taxing the risk premium, the efficiency of the tax system is increased. The welfare effect is larger if the risk premium is bigger and the portfolio share is larger.

The underlying reason is that there is a missing insurance market – given that all risk is idiosyncratic. The government improves on social insurance by alleviating this market failure, while not generating additional distortions, neither in saving nor in risk-taking.

[8]The comparative statics of this particular tax reform are identical to the comparative statics of a tax on the risk-premium alone, as demonstrated by Boadway and Spiritus (2024). Intuitively, the joint tax reform of raising the capital income tax and lowering the wealth tax is equivalent to raising the tax on the risk-premium.

Distortions in saving and portfis captured by the second and third terms on the right-hand side. There is no effect on saving ($\varepsilon_{a\tau^I} = 0$), since intertemporal price of consumption does not change. Moreover, while risk-taking is not distorted – taxes on wealth and capital income affect safe and risky assets symmetrically –, it is enhanced via the Domar-Musgrave effect ($\varepsilon_{\omega\tau^I} = 1$). Indeed, as the government better insures risk in capital incomes, individuals respond by increasing their portfolio share of risky assets. As a result of larger risk-taking, the government also collects more revenue from taxing the risk-premium.

From this analysis follows the important insight that the two-period portfolio choice models can be fully generalized to T-period settings. Indeed, the Merton-Samuelson model reveals that – due to its recursive structure – the T-period model is just like a large collection of two-period models.

An often-used argument in the debate on taxes on wealth versus capital income is that wealth is amortized capital income earned in previous periods of the life-cyle. Hence, as the time-horizon of the investor becomes longer, the distinction between taxes on wealth and on capital income gradually vanishes over time as wealth at later periods boils down more to cumulated capital income over time. The wealth tax would then start to resemble more and more a tax on capital income if it were to be levied in the more distant future. However, the analysis above reveals that this intuition is misleading. Given the recursive structure, the choice between taxing wealth or capital income is solely determined by the desire to tax the risk premium. The relative benefits of doing so increase linearly in the stock of wealth. Hence, the merits of taxing wealth are *not* driven by the benefits of taxing previously earned capital income.

4.3 Ex post wealth taxes

So far we only analyzed ex ante taxes on wealth τ_t^A. But what can we say about ex post taxes on wealth τ_t^P? One may argue that ex post wealth taxes include the risk-premium in the tax base. Hence, ex post taxes may still be more desirable then ex ante taxes on wealth, which do not include the risk-premium in the tax base at all. Therefore, this section explores the role of ex post wealth taxes along the same lines as ex ante wealth taxes in the model with idiosyncratic risk.

With ex post wealth taxes τ_t^P, the net return factor R_t is modified for each realization θ_t:

$$R_t \equiv (1-\tau_t^P)[(1+(1-\tau_t^I)\rho)(1-\omega_t) + (1+(1-\tau_t^I)r_t(\theta_t))\omega_t]. \tag{21}$$

Like before, we will analyze tax reforms that raise the capital income tax and lower the wealth tax such that the net, after tax safe rate of return does not change. The next Lemma provides this tax reform.

Lemma 4 (Tax reform ex post wealth tax) *The net, after-tax safe rate of return is given by* $(1-\tau_t^P)(1+(1-\tau_t^I)\rho)-1$*. Any reform of taxes on wealth and capital income that leaves the intertemporal price of consumption unaffected satisfies* $\mathrm{d}\tau_t^P = -\frac{(1-\tau_t^P)\rho}{1+(1-\tau_t^I)\rho}\mathrm{d}\tau_t^I$.

We can also derive the comparative statics on saving and portfolio behavior of the tax reform described in the previous Lemma.

Lemma 5 (Comparative statics tax reform) *Consider an increase in the tax on capital income and a reduction in the tax on wealth in any period t such expected utility remains fixed:* $\mathrm{d}\tau_t^P = -\frac{(1-\tau_t^P)\rho}{1+(1-\tau_t^I)\rho}\mathrm{d}\tau_t^I$. *This tax reform has the following comparative statics:*

1. *The intertemporal price of consumption in period t does not change ($\mathrm{d}((1-\tau_t^P)(1+(1-\tau_t^I)\rho_t))=0$),*

2. *Total saving and consumption choices in period t are not affected ($\mathrm{d}(y_t+a_t-c_t)=0$),*

3. *The share of risky assets portfolio increases such that the same risk-return trade-off is obtained in period t: $\frac{(1-\tau_t^I)}{\omega_t}\frac{\mathrm{d}\omega_t}{\mathrm{d}\tau_t^I}=1$ (Domar and Musgrave, 1944).*

The policy elasticities of saving and portfolio weights under the tax reform are then given by:

$$\varepsilon_{a\tau^I} \equiv -\frac{\mathrm{d}a_{t+1}}{\mathrm{d}\tau_t^I}\frac{(1-\tau_t^I)}{a_{t+1}} = 0, \quad \varepsilon_{\omega\tau^I} \equiv \frac{\mathrm{d}\omega_t}{\mathrm{d}\tau_t^I}\frac{(1-\tau_t^I)}{\omega_t} = 1. \tag{22}$$

The government budget constraint under ex post wealth taxes, with idiosyncratic risk, can be written as:

$$d_{t+1}-d_t = \rho d_t + G_t - \tau_t^I(\rho+\pi_t\omega_t)a_{t+1} - \tau_t^P(1+(1-\tau_t^I)(\rho+\pi_t\omega_t))a_{t+1}. \tag{23}$$

Armed with the definition of the tax reform and the comparative statics, we can generalize our first Proposition to ex post wealth taxes in the next Proposition.

Proposition 2 (Superiority of taxes on capital income over ex post taxes on wealth) *Starting from an initial tax system with positive taxes on capital income and on wealth, presuming that all risk in capital income is idiosyncratic, if the tax on capital income is raised, and the ex post tax on wealth is lowered such that $\mathrm{d}\tau_t^P = -\frac{(1-\tau_t^P)\rho}{1+(1-\tau_t^I)\rho}\mathrm{d}\tau_t^I$, then social welfare in period t increases according to:*

$$\begin{aligned}
\frac{\mathrm{d}\mathcal{R}_t/\mathrm{d}\tau_t^I}{a_{t+1}} &= \frac{\pi_t\omega_t+\rho(\tau_t^P+\tau_t^I(1-\tau_t^P)(\rho+\pi_t\omega_t))}{1+(1-\tau_t^I)\rho} \\
&\quad -\frac{(\tau_t^I(\rho+\pi_t\omega_t)+\tau_t^P(1+(1-\tau_t^I)(\rho+\pi_t\omega_t)))}{(1-\tau_t^I)}\varepsilon_{a\tau^I} + \frac{(\tau_t^I+\tau_t^P(1-\tau_t^I))}{(1-\tau_t^I)}\pi_t\omega_t\varepsilon_{\omega\tau^I} \\
&= \frac{\pi_t\omega_t+\rho(\tau_t^P+\tau_t^I(1-\tau_t^P)(\rho+\pi_t\omega_t))}{1+(1-\tau_t^I)\rho} + \frac{(\tau_t^I+\tau_t^P(1-\tau_t^I))}{(1-\tau_t^I)}\pi_t\omega_t
\end{aligned} \tag{24}$$

where the the elasticities follow from Lemma (3).

Proof See Appendix.

The expression for the revenue effect of the tax reform is considerably more complicated with ex post than ex ante wealth taxes. Nevertheless, the interpretation of Proposition 2 remains exactly the same as Proposition 1. Indeed, replacing the ex post wealth tax with a capital income tax is unambigously welfare-improving, since it moves a larger part of the tax burden to the risk-premium (first term of the last line in Proposition 2). Moreover, the tax reform enhances risk taking, which now yields additional tax revenue from the capital income tax and from the ex post wealth tax (second term of the last line in Proposition 2). Consequently, the basic logic why a capital income tax is welfare superior than a wealth tax extends fully to the case with ex post wealth taxes.

4.4 Welfare effects tax reform – aggregate risk

In this section, we explore the case with aggregate risk. As a result, government revenue is stochastic. The change in expected tax revenue can then no longer serve as a statistic for the welfare effects of the tax reform, since the government needs to raise or lower public good provision such that the government budget constraint holds for each state realization θ_t.[9] So, the policy experiment with aggregate risk is slightly more involved than with aggregate risk: the government adjusts taxes on capital income and wealth according to eq. (2) (i.e., $\mathrm{d}\tau_t^A = -\rho \mathrm{d}\tau_t^I < 0$), *and* it adjusts public goods in each state θ_t such that eq. (16) holds under the reform (i.e., $\mathrm{d}\mathcal{R}_t = 0$, $\mathrm{d}G_t \gtreqless 0$ for any θ_t). To find the welfare effect of the reform, we calculate the change in expected utility under the tax reform *joint* with a state-contingent change in public goods provision to balance the budget.[10] This gives the second main Proposition of the paper.

Proposition 3 (Superiority of taxes on capital income over taxes on wealth) *Starting from an initial tax system with positive taxes on capital income and on wealth, presuming that all risk in capital income is aggregate risk, if the tax on capital income is raised, and the tax on wealth is lowered such that* $\mathrm{d}\tau_t^A = -\rho \mathrm{d}\tau_t^I$*, and the government rebates any stochastic change in resources by adjusting public goods provision such that* $\mathrm{d}\mathcal{R}_t = 0$*, and* $\mathrm{d}G_t \gtreqless 0$ *for any* θ_t*, then social welfare changes in period* t *according to:*

$$\begin{aligned}\frac{\mathrm{d}\mathcal{V}_t(a_t)/\mathrm{d}\tau_t^I}{u'(c_t)a_{t+1}} &= \pi_t\omega_t - \frac{(\tau_t^I(\rho+\pi_t\omega_t)+\tau_t^A)}{1-\tau_t^I}\varepsilon_{a\tau^I} + \frac{\tau_t^I}{1-\tau_t^I}\pi_t\omega_t\varepsilon_{\omega\tau^I} \\ &\quad + \frac{1}{a_{t+1}}\mathrm{E}_t\left[\left(\frac{\Gamma'(G_t)}{u'(c_t)}-1\right)\frac{\mathrm{d}G_t}{\mathrm{d}\tau_t^I}\right] \\ &= \frac{\pi_t\omega_t}{1-\tau_t^I} + \frac{1}{a_{t+1}}\mathrm{E}_t\left[\left(\frac{\Gamma'(G_t)}{u'(c_t)}-1\right)\frac{\mathrm{d}G_t}{\mathrm{d}\tau_t^I}\right],\end{aligned} \tag{25}$$

where the signs of the elasticities follow from Lemma (3).

Proof See Appendix.

This Proposition demonstrates that the welfare effects of the tax reform under aggregate risk are the same as the welfare effects under idiosyncratic risk, up to one term. In particular,

[9]Returning stochastic government revenue in the form of a state-contingent lump-sum transfer would not yield any welfare gains as Gordon (1985) and Kaplow (1994) have shown. Intuitively, the government returns financial risk to households one-for-one and hence cannot share in the risk-premium.

[10]If we would conduct the same policy experiment for the case with idiosyncratic risk, i.e., transfer higher public revenue back in the form of larger public goods provision, the conclusions would remain unaffected. Intuitively, transferring higher, deterministic government revenue back in the form of transfers or public goods does not make a qualitative difference. See Appendix.

the first three terms of eq. (25) are the same as the welfare effects of the tax reform under idiosyncratic risk, cf. eq. (20). The intuition is the same. The tax reform moves the tax burden to the risk premium, which is more efficient. Moreover, there is no effect on saving, just as before, and the Domar-Musgrave effect indicates that there is an increase in risk-taking, just as before. The latter contributes to raising tax revenue.

However, the main difference with the case with only idiosyncratic risk, is that the desirability of the tax reforn now depends on whether public goods provision is sub-optimally high or not. In particular, if public goods provision is sub-optimally low, then $\mathrm{E}_t\left[\left(\frac{\Gamma'(G_t)}{u'(c_t)}-1\right)\frac{\mathrm{d}G_t}{\mathrm{d}\tau_t^I}\right]>0$, and an increase in tax revenue allows for more public goods provision. The tax reform then alleviates sub-optimally low provision of public goods. However, if public goods provision is sub-optimally high, i.e., $\mathrm{E}_t\left[\left(\frac{\Gamma'(G_t)}{u'(c_t)}-1\right)\frac{\mathrm{d}G_t}{\mathrm{d}\tau_t^I}\right]<0$, and the tax reform exacerbates the sub-optimal high provision of public goods by boostsing tax revenue, which is rebated in larger public goods provision.

The intuition here is that with aggregate risk, the government wants to optimally diversify this financial risk over private and public consumption, see Christiansen (1993), Schindler (2008), and Boadway and Spiritus (2024). Consequently, there is an interior optimum for the optimal tax on capital income, which ensures that the optimal level of public goods is sustained.

Whether the tax reform with aggregate risk is welfare improving thus depends on whether public goods provision is efficient or not. Provided public goods provision is not 'too' inefficient, i.e., $\int_\Theta\left(\frac{\Gamma'(G_t)}{u'(c_t)}-1\right)f(\theta_t)\mathrm{d}\theta_t<<0$, a tax reform that imposes higher taxes on capital incomes and lower taxes on wealth is still welfare improving.

5 Optimal taxation

This final Section analyzes optimal taxes on capital income and wealth for the separate cases where risk is idiosyncratic or aggregate. In doing so, this Section extends the analyses in Christiansen (1993), Schindler (2008), and Boadway and Spiritus (2024) to multiple periods in the Merton-Samuelson framework. Proposition 4 gives optimal tax policy with idiosyncratic risk and Proposition 5 gives optimal tax policy with aggregate risk.

Proposition 4 (Optimal taxation and public good provision with idiosyncratic risk) *If capital income risk is purely idiosyncratic, and the government can optimize both taxes on capital income and ex ante or ex post taxes on wealth, and optimally provides public goods, then the optimal tax on capital income in each period t is $\tau_t^I=1$, the ex ante or ex post wealth tax are equal to $\tau_t^A=\tau_t^P=-\rho$, and public goods provision is non-stochastic and follows the Samuelson rule $\Gamma'(G_t)/u'(c_t)=1$.*

Proposition 5 (Optimal taxation and public good provision with aggregate risk) *If capital-income risk is aggregate risk, and the government can optimize both taxes on capital income and ex ante or ex post taxes on wealth, and optimally provides public goods, then the optimal tax on capital income is positive $\tau_t^I>0$, the ex ante or ex post wealth tax ensure intertemporal efficiency in saving ($\tau_t^A=-\tau_t^I\rho$ or $\tau_t^P=-\frac{\tau_t^I\rho}{1+(1-\tau_t^I)\rho}$), and public goods provision is stochastic and satisfies a risk-adjusted Samuelson rule: $\frac{\mathrm{E}[\Gamma'(G_t)]}{u'(c_t)}=1$.*

Proof See Appendix.

These propositions demonstrate that the insights derived from two-period frameworks in Christiansen (1993), Schindler (2008), and Boadway and Spiritus (2024) fully carry over to T-periods. Indeed, no new insights are obtained.

6 Conclusion

Should we tax capital income or wealth? The answer is: we should tax capital income. This conclusion is derived by analyzing taxes on capital income and wealth in a standard Merton-Samuelson portfolio model with safe and risky assets where risk may either be idiosyncratic, individual or systematic, aggregate risk. Compensated tax reforms are analyzed where taxes on capital income are increased, while taxes on wealth are decreased. Such tax reforms are found to be welfare improving because taxes on capital income impose a non-distorting tax on the risk-premium, whereas taxes on wealth do not. Hence, for the same distortions, taxes on capital income generate more revenue than taxes on wealth. Optimal taxes on capital income and wealth are derived. Taxes on capital income are used to tax the risk premium, while (negative) taxes on wealth should ensure intertemporal efficiency, which would boil down to a tax a rate of return allowance, joint with a tax on capital income.

A Proof Bellman recursion

At time $t = T - 1$ the individual has only one period left to make choices. In the last period $t = T$, we obtain from the HBC the following expression

$$c_T = y_T + a_T - \frac{a_{T+1}}{R_T}. \tag{26}$$

Note that terminal assets are zero ($a_{T+1} = 0$), so that the final-period budget constraint can be written as

$$c_T = y_T + a_T. \tag{27}$$

Now, for $t = T - 1$ we have the following budget constraint:

$$c_{T-1} = y_{T-1} + a_{T-1} - \frac{a_T}{R_{T-1}} \tag{28}$$

We can eliminate a_T and substitute the result into the expression for c_T to find:

$$c_T = y_T + (y_{T-1} + a_{T-1} - c_{T-1})R_{t-1}, \tag{29}$$

Hence, the value function for the last stage can be written as:

$$\mathcal{V}_{T-1}(a_{T-1}) \equiv \max_{\{c_T,\omega_T\}} u(c_{T-1})+\mathrm{E}_{T-1}[\Gamma(G_{T-1})]+\frac{1}{(1+\beta)}\mathrm{E}_{T-1}u(y_T+(y_{T-1}+a_{T-1}-c_{T-1})R_{t-1}, G_T). \tag{30}$$

In this last period, we thus have a completely standard portfolio choice as in a two-period model. This yields the first-order conditions with respect to consumption c_{T-1} and the portfolio weight ω_{T-1} to find:

$$u'(c_{T-1}) = \frac{1}{(1+\beta)} \mathrm{E}_{T-1}[u'(c_T) R_{t-1}]. \tag{31}$$

$$\mathrm{E}_{T-1}\left[u'(c_T)(y_{T-1} + a_{T-1} - c_{T-1})(1-\tau^I_{T-1})(r_{T-1}(\theta_{T-1}) - \rho)\right] = 0. \tag{32}$$

where we used the derivative of the return function in the last derivation: $\frac{\partial R_{T-1}}{\partial \omega_{T-1}} = (1 - \tau^I_{T-1})(r_{T-1}(\theta_{T-1}) - \rho)$. The solution of these FOCs yields optimal consumption c^*_{T-1} and optimal portfolio choice ω^*_{T-1}.

One period earlier, we have the following Bellman recursion:

$$\mathcal{V}_{T-2}(a_{T-2}) \equiv \max_{c_{T-2},\omega_{T-2}} u(c_{T-2}) + \mathrm{E}_{T-2}[\Gamma(G_{T-2})] + \frac{1}{(1+\beta)} \mathrm{E}_{T-2}[\mathcal{V}_{T-1}(a_{T-1})]. \tag{33}$$

We can eliminate a_{T-1} by rewriting the household budget constraint:

$$a_{T-1} = (y_{T-2} + a_{T-2} - c_{T-2}) R_{T-2}. \tag{34}$$

Substitute this result into the second-to-last period value function to find:

$$\mathcal{V}_{T-2}(a_{T-2}) \equiv \max_{c_{T-2},\omega_{T-2}} u(c_{T-2}) + \mathrm{E}_{T-2}[\Gamma(G_{T-2})] + \frac{1}{(1+\beta)} \mathrm{E}_{T-2}[\mathcal{V}_{T-1}((y_{T-2} + a_{T-2} - c_{T-2}) R_{T-2})]. \tag{35}$$

Once again, this is a static portfolio problem with standard first-order conditions:

$$u'(c_{T-2}) = \frac{1}{(1+\beta)} \mathrm{E}_{T-2}[\mathcal{V}'_{T-1}(.) R_{T-2})], \tag{36}$$

$$\mathrm{E}_{T-2}[\mathcal{V}'_{T-1}(.)(y_{T-2} + a_{T-2} - c_{T-2})(1-\tau^I_{T-2})(r_{T-2}(\theta_{T-2}) - \rho)] = 0. \tag{37}$$

The solution of these FOCs yields optimal consumption c^*_{T-2} and optimal portfolio choice ω^*_{T-2}.

Doing this recursively back to time $t = T-2, T-4, ..., 2, 1, 0$ we find the general recursive solution. In particular, for period 0 we can write the household budget constraint as:

$$a_1 = (y_0 + a_0 - c_0) R_0. \tag{38}$$

Hence, the period-0 recursion of the Bellman equation is:

$$\mathcal{V}_0(a_0) \equiv \max_{c_0,\omega_0} u(c_0) + \mathrm{E}_0[\Gamma(G_0)] + \frac{1}{(1+\beta)} \mathrm{E}_0[\mathcal{V}_1((y_0 + a_0 - c_0) R_0)]. \tag{39}$$

First-order conditions are given by:

$$u'(c_0) = \frac{1}{(1+\beta)} \mathrm{E}_0[\mathcal{V}'_1(.) R_0], \tag{40}$$

$$\mathrm{E}_0[\mathcal{V}'_1(.)(y_0 + a_0 - c_0)(1-\tau^I_0)(r_0(\theta_0) - \rho)] = 0. \tag{41}$$

The solution of these FOCs yields optimal consumption c^*_0 and optimal portfolio choice ω^*_0.

For any period t, we have the following Bellman recursion:

$$\mathcal{V}_t(a_t) \equiv \max_{c_t,\omega_t} u(c_t) + \mathrm{E}_t[\Gamma(G_t)] + \frac{1}{(1+\beta)}\mathrm{E}_t[\mathcal{V}_{t+1}((y_t + a_t - c_t)R_t)], \tag{42}$$

with the following first-order conditions for optimal consumption and portfolio choices:

$$u'(c_t) = \frac{1}{(1+\beta)}\mathrm{E}_t[\mathcal{V}'_{t+1}(\cdot)R_t], \tag{43}$$

$$\mathrm{E}_t[\mathcal{V}'_{t+1}(\cdot)(y_t + a_t - c_t)(1-\tau_t^I)(r_t(\theta_t) - \rho)] = 0. \tag{44}$$

The solution of these FOCs yields optimal consumption c_t^* and optimal portfolio choice ω_t^* for any t.

B Proof stochastic Roy's Lemma

The period-t recursion has derivatives:

$$\mathcal{V}_t(a_t) \equiv \max_{c_t,\omega_t} u(c_t) + \mathrm{E}_t[\Gamma(G_t)] + \frac{1}{(1+\beta)}\mathrm{E}_t[\mathcal{V}_{t+1}((y_t + a_t - c_t)R_t)] \tag{45}$$

$$\frac{\partial \mathcal{V}_t(a_t)}{\partial a_t} = \frac{1}{(1+\beta)}\mathrm{E}_t[\mathcal{V}'_{t+1}(.)R_t] = u'(c_t), \tag{46}$$

$$\frac{\partial \mathcal{V}_t(a_t)}{\partial \tau_t^I} = -\frac{1}{(1+\beta)}\mathrm{E}_t[\mathcal{V}'_{t+1}(.)(y_t + a_t - c_t)(\rho(1-\omega_t) + r_t(\theta_t)\omega_t)], \tag{47}$$

$$\frac{\partial \mathcal{V}_t(a_t)}{\partial \tau_t^A} = -\frac{1}{(1+\beta)}\mathrm{E}_t[\mathcal{V}'_{t+1}(.)(y_t + a_t - c_t)], \tag{48}$$

$$\frac{\partial \mathcal{V}_t(a_t)}{\partial G_t} = \Gamma'(G_t)f(\theta_t). \tag{49}$$

These derivatives can be simplified as follows. From the FOC for ω_t follows:

$$\frac{\mathrm{E}_t[\mathcal{V}'_{t+1}(.)r_t(\theta_t)]}{\mathrm{E}_t[\mathcal{V}'_{t+1}(.)]} = \rho. \tag{50}$$

Note that optimal risk-taking is not directly affected by tax parameters since taxes affect all assets symmetrically. Substitute this in the derivative of τ_t^I to find:

$$\begin{aligned}
\frac{\partial \mathcal{V}_t(a_t)}{\partial \tau_t^I} &= -\frac{1}{(1+\beta)}\mathrm{E}_t[\mathcal{V}'_{t+1}(.)(y_t + a_t - c_t)(\rho(1-\omega_t) + r_t(\theta_t)\omega_t)] \\
&= -\frac{1}{(1+\beta)}(y_t + a_t - c_t)\mathrm{E}_t[\mathcal{V}'_{t+1}(.)]\left[\rho(1-\omega_t) + \omega_t\frac{\mathrm{E}_t[\mathcal{V}'_{t+1}(.)r_t(\theta_t)]}{\mathrm{E}_t[\mathcal{V}'_{t+1}(.)]}\right] \\
&= -\frac{\mathrm{E}_t[\mathcal{V}'_{t+1}(.)]}{(1+\beta)}(y_t + a_t - c_t)\rho.
\end{aligned} \tag{51}$$

Slightly rewrite the derivative of τ_t^A to find

$$\frac{\partial \mathcal{V}_t(a_t)}{\partial \tau_t^A} = -\frac{1}{(1+\beta)}\mathrm{E}_t[\mathcal{V}'_{t+1}(.)(y_t + a_t - c_t)] = -\frac{\mathrm{E}_t[\mathcal{V}'_{t+1}(.)]}{(1+\beta)}(y_t + a_t - c_t). \tag{52}$$

C Proof comparative statics

To be done. See also Boadway and Spiritus (2024) Lemma 1.

D Proof Proposition 1

Total utility remains constant under the reform, which can be established by totally differentiating the Bellman recursion at time t in equation (5):

$$\mathrm{d}\mathcal{V}_t(a_t) = \frac{\partial \mathcal{V}_t(a_t)}{\partial \tau_t^I}\mathrm{d}\tau_t^I + \frac{\partial \mathcal{V}_t(a_t)}{\partial \tau_t^A}\mathrm{d}\tau_t^A. \tag{53}$$

After substituting the derivatives of the value function from Lemma 1 we find:

$$\mathrm{d}\mathcal{V}_t(a_t) = \left[-\frac{\mathrm{E}_t[\mathcal{V}'_{t+1}(.)]}{(1+\beta)}(y_t + a_t - c_t)\right](\rho \mathrm{d}\tau_t^I + \mathrm{d}\tau_t^A) = 0, \tag{54}$$

where we substituted the tax reform that keeps the intertemporal price of consumption fixed ($\mathrm{d}\tau_t^A = -\rho \mathrm{d}\tau_t^I$) in the last step. Hence, the value function does not change under the tax reform and expected utility remains constant.

Totally differentiating the government budget constraint – while keeping public spending G_t constant – then gives:

$$\mathrm{d}\mathcal{R}_t = (\rho + \pi_t\omega_t)a_{t+1}\mathrm{d}\tau_t^I + a_{t+1}\mathrm{d}\tau_t^A + (\tau_t^I(\rho + \pi_t\omega_t) + \tau_t^A)\mathrm{d}a_{t+1} + \tau_t^I a_{t+1}\pi_t \mathrm{d}\omega_t \tag{55}$$

Given that we have a partial-equilibrium set-up, the risk-premium remains unaffected by a marginal change in tax policy ($\mathrm{d}\pi_t = 0$). Substituting for the tax reform (i.e., $\mathrm{d}\tau_t^A = -\rho \mathrm{d}\tau_t^I$) and rewriting yields:

$$\frac{\mathrm{d}\mathcal{R}_t/\mathrm{d}\tau_t^I}{a_{t+1}} = \pi_t\omega_t - \frac{(\tau_t^I(\rho + \pi_t\omega_t) + \tau_t^A)}{1-\tau_t^I}\varepsilon_{a\tau^I} + \frac{\tau_t^I}{1-\tau_t^I}\pi_t\omega_t\varepsilon_{\omega\tau^I}, \tag{56}$$

D.1 Check: Rebate the revenue via a change in public goods

Totally differentiating the Bellman recursion at time t in equation (5) gives:

$$\mathrm{d}\mathcal{V}_t(a_t) = \frac{\partial \mathcal{V}_t(a_t)}{\partial \tau_t^I}\mathrm{d}\tau_t^I + \frac{\partial \mathcal{V}_t(a_t)}{\partial \tau_t^A}\mathrm{d}\tau_t^A + \int_\Theta \frac{\partial \mathcal{V}_t(a_t)}{\partial G_t}\mathrm{d}G_t f(\theta_t)\mathrm{d}\theta_t. \tag{57}$$

Substituting the derivatives of the value function from Lemma 1 gives:

$$\mathrm{d}\mathcal{V}_t(a_t) = \left[-\frac{\mathrm{E}_t[\mathcal{V}'_{t+1}(.)]}{(1+\beta)}(y_t + a_t - c_t)\right](\rho \mathrm{d}\tau_t^I + \mathrm{d}\tau_t^A) + \Gamma'(G_t)\mathrm{d}G_t = \Gamma'(G_t)\mathrm{d}G_t, \tag{58}$$

where we substituted the tax reform that keeps the intertemporal price of consumption fixed ($\mathrm{d}\tau_t^A = -\rho \mathrm{d}\tau_t^I$) in the second line.

Totally differentiating the government budget constraint, while allowing public spending G_t

to change, then gives (note that $\mathrm{d}\mathcal{R}_t = 0$):

$$\mathrm{d}G_t = (\rho + \pi_t\omega_t)a_{t+1}\mathrm{d}\tau_t^I + a_{t+1}\mathrm{d}\tau_t^A + (\tau_t^I(\rho + \pi_t\omega_t) + \tau_t^A)\mathrm{d}a_{t+1} + \tau_t^I a_{t+1}\pi_t\mathrm{d}\omega_t \tag{59}$$

Given that we have a partial-equilibrium set-up, the risk-premium remains unaffected by a marginal change in tax policy ($\mathrm{d}\pi_t = 0$). Substituting for the tax reform (i.e., $\mathrm{d}\tau_t^A = -\rho\mathrm{d}\tau_t^I$) and rewriting yields:

$$\frac{\mathrm{d}G_t/\mathrm{d}\tau_t^I}{a_{t+1}} = \pi_t\omega_t - \frac{(\tau_t^I(\rho + \pi_t\omega_t) + \tau_t^A)}{1 - \tau_t^I}\varepsilon_{a\tau^I} + \frac{\tau_t^I}{1 - \tau_t^I}\pi_t\omega_t\varepsilon_{\omega\tau^I}, \tag{60}$$

So we find:

$$\frac{\mathrm{d}\mathcal{V}_t(a_t)/\mathrm{d}\tau_t^I}{u'(c_t)a_{t+1}} = \frac{\Gamma'(G_t)}{u'(c_t)}\left(\pi_t\omega_t - \frac{(\tau_t^I(\rho + \pi_t\omega_t) + \tau_t^A)}{1 - \tau_t^I}\varepsilon_{a\tau^I} + \frac{\tau_t^I}{1 - \tau_t^I}\pi_t\omega_t\varepsilon_{\omega\tau^I}\right). \tag{61}$$

This implies that the conclusion is independent from whether the rebate of larger tax revenue is via a lump-sum transfer or via larger public goods provision.

E Proof Proposition 2

Total utility remains constant under the reform, which can be established by totally differentiating the Bellman recursion at time t in equation (5):

$$\mathrm{d}\mathcal{V}_t(a_t) = \frac{\partial\mathcal{V}_t(a_t)}{\partial\tau_t^I}\mathrm{d}\tau_t^I + \frac{\partial\mathcal{V}_t(a_t)}{\partial\tau_t^P}\mathrm{d}\tau_t^P. \tag{62}$$

After substituting the derivatives of the value function from the equivalent of Lemma 1 for ex post wealth taxes we find:

$$\mathrm{d}\mathcal{V}_t(a_t) = \left[-\frac{\mathrm{E}_t[\mathcal{V}_{t+1}'(.)]}{(1+\beta)}(y_t + a_t - c_t)\right]\left(\frac{(1-\tau_t^P)\rho}{1 + (1-\tau_t^I)\rho}\mathrm{d}\tau_t^I + \mathrm{d}\tau_t^P\right) = 0, \tag{63}$$

where we substituted the tax reform that keeps the intertemporal price of consumption fixed ($\mathrm{d}\tau_t^P = -\frac{(1-\tau_t^P)\rho}{1+(1-\tau_t^I)\rho}\mathrm{d}\tau_t^I$) in the last step. Hence, the value function does not change under the tax reform and expected utility remains constant.

Totally differentiating the government budget constraint – while keeping public spending G_t constant – then gives:

$$\mathcal{R}_t \equiv (1+\rho)d_t - d_{t+1} = \tau_t^I(\rho + \pi_t\omega_t)a_{t+1} + \tau_t^P(1 + (1-\tau_t^I)(\rho + \pi_t\omega_t))a_{t+1} - G_t. \tag{64}$$

$$\begin{aligned}\mathrm{d}\mathcal{R}_t &= (\rho + \pi_t\omega_t)a_{t+1}\mathrm{d}\tau_t^I + (1 + (1-\tau_t^I)(\rho + \pi_t\omega_t))a_{t+1}\mathrm{d}\tau_t^P \\ &+ (\tau_t^I(\rho + \pi_t\omega_t) + \tau_t^P(1 + (1-\tau_t^I)(\rho + \pi_t\omega_t)))\mathrm{d}a_{t+1} + (\tau_t^I\pi_t a_{t+1} + \tau_t^P(1-\tau_t^I)\pi_t a_{t+1})\mathrm{d}\omega_t\end{aligned} \tag{65}$$

Like before, the risk-premium remains unaffected by a marginal change in tax policy ($\mathrm{d}\pi_t = 0$).

Substituting for the tax reform (i.e., $\mathrm{d}\tau_t^P = -\frac{(1-\tau_t^P)\rho}{1+(1-\tau_t^I)\rho}\mathrm{d}\tau_t^I$) and rewriting yields:

$$\begin{aligned}\frac{\mathrm{d}\mathcal{R}_t/\mathrm{d}\tau_t^I}{a_{t+1}} &= \left[(\rho+\pi_t\omega_t) - (1+(1-\tau_t^I)(\rho+\pi_t\omega_t))\left(\frac{(1-\tau_t^P)\rho}{1+(1-\tau_t^I)\rho}\right)\right] \\ &+ \frac{(\tau_t^I(\rho+\pi_t\omega_t)+\tau_t^P(1+(1-\tau_t^I)(\rho+\pi_t\omega_t)))}{(1-\tau_t^I)}\frac{\mathrm{d}a_{t+1}}{\mathrm{d}\tau_t^I}\frac{(1-\tau_t^I)}{a_{t+1}} \\ &+ \frac{(\tau_t^I+\tau_t^P(1-\tau_t^I))}{(1-\tau_t^I)}\pi_t\omega_t\frac{\mathrm{d}\omega_t}{\mathrm{d}\tau_t^I}\frac{(1-\tau_t^I)}{\omega_t}.\end{aligned} \tag{66}$$

$$\begin{aligned}\frac{\mathrm{d}\mathcal{R}_t/\mathrm{d}\tau_t^I}{a_{t+1}} &= \frac{\pi_t\omega_t+\rho(\tau_t^P+\tau_t^I(1-\tau_t^P)(\rho+\pi_t\omega_t))}{1+(1-\tau_t^I)\rho} \\ &- \frac{(\tau_t^I(\rho+\pi_t\omega_t)+\tau_t^P(1+(1-\tau_t^I)(\rho+\pi_t\omega_t)))}{(1-\tau_t^I)}\varepsilon_{a\tau^I} + \frac{(\tau_t^I+\tau_t^P(1-\tau_t^I))}{(1-\tau_t^I)}\pi_t\omega_t\varepsilon_{\omega\tau^I} \\ &= \frac{\pi_t\omega_t+\rho(\tau_t^P+\tau_t^I(1-\tau_t^P)(\rho+\pi_t\omega_t))}{1+(1-\tau_t^I)\rho} + \frac{(\tau_t^I+\tau_t^P(1-\tau_t^I))}{(1-\tau_t^I)}\pi_t\omega_t.\end{aligned} \tag{67}$$

F Proof Proposition 4

Totally differentiating the period-t value function gives:

$$\mathrm{d}\mathcal{V}_t(a_t) = \frac{\partial\mathcal{V}_t(a_t)}{\partial\tau_t^I}\mathrm{d}\tau_t^I + \frac{\partial\mathcal{V}_t(a_t)}{\partial\tau_t^A}\mathrm{d}\tau_t^A + \int_\Theta \frac{\partial\mathcal{V}_t(a_t)}{\partial G_t}\mathrm{d}G_t f(\theta_t)\mathrm{d}\theta_t. \tag{68}$$

Note that public goods provision is different in each state θ_t, since the government budget is now stochastic.

Substituting the derivatives of the value function from eq. (1) gives:

$$\mathrm{d}\mathcal{V}_t(a_t) = \left[-\frac{\mathrm{E}_t[\mathcal{V}'_{t+1}(.)]}{(1+\beta)}(y_t+a_t-c_t)\right](\rho\mathrm{d}\tau_t^I + \mathrm{d}\tau_t^A) + \int_\Theta \Gamma'(G_t)\mathrm{d}G_t f(\theta_t)\mathrm{d}\theta_t. \tag{69}$$

Substituting the tax reform yields that the first two terms vanishes (as we had before with idiosyncratic risk):

$$\frac{\mathrm{d}\mathcal{V}_t(a_t)}{u'(c_t)} = \int_\Theta \frac{\Gamma'(G_t)}{u'(c_t)}\mathrm{d}G_t f(\theta_t)\mathrm{d}\theta_t. \tag{70}$$

Totally differentiating the government budget constraint, while allowing public goods to adjust, and imposing budget balance, gives for each realization θ_t:

$$\mathcal{R}_t = (1+\rho)d_t - d_{t+1} = \tau_t^I(\rho+(r_t(\theta_t)-\rho)\omega_t)a_{t+1} + \tau_t^A a_{t+1} - G_t. \tag{71}$$

$$\begin{aligned} 0 &= \mathrm{d}\mathcal{R}_t = (\rho+(r_t(\theta_t)-\rho)\omega_t)a_{t+1}\mathrm{d}\tau_t^I + a_{t+1}\mathrm{d}\tau_t^A \\ &+ (\tau_t^I(\rho+(r_t(\theta_t)-\rho)\omega_t)+\tau_t^A)\mathrm{d}a_{t+1} + \tau_t^I a_{t+1}(r_t(\theta_t)-\rho)\mathrm{d}\omega_t - \mathrm{d}G_t.\end{aligned} \tag{72}$$

$$\begin{aligned}\mathrm{d}G_t &= (\rho(1-\omega_t)+r_t(\theta_t)\omega_t)a_{t+1}\mathrm{d}\tau_t^I + a_{t+1}\mathrm{d}\tau_t^A \\ &+ (\tau_t^I(\rho(1-\omega)+r_t(\theta_t)\omega_t)+\tau_t^A)\mathrm{d}a_{t+1} + \tau_t^I a_{t+1}(r_t(\theta_t)-\rho)\mathrm{d}\omega_t.\end{aligned} \tag{73}$$

Take expectations from both sides:

$$\int_\Theta \mathrm{d}G_t f(\theta_t)\mathrm{d}\theta_t = \rho(1-\omega_t)a_{t+1}\mathrm{d}\tau_t^I + \tau_t^I\rho(1-\omega)\mathrm{d}a_{t+1} - \tau_t^I a_{t+1}\rho\mathrm{d}\omega_t + a_{t+1}\mathrm{d}\tau_t^A + \tau_t^A\mathrm{d}a_{t+1}$$
$$+ \int_\Theta [r_t(\theta_t)\omega_t a_{t+1}\mathrm{d}\tau_t^I + \tau_t^I r_t(\theta_t)\omega_t\mathrm{d}a_{t+1} + \tau_t^I r_t(\theta_t)a_{t+1}\mathrm{d}\omega_t]f(\theta_t)\mathrm{d}\theta_t. \quad (74)$$

$$\int_\Theta \mathrm{d}G_t f(\theta_t)\mathrm{d}\theta_t = \rho(1-\omega_t)a_{t+1}\mathrm{d}\tau_t^I + \tau_t^I\rho(1-\omega)\mathrm{d}a_{t+1} - \tau_t^I a_{t+1}\rho\mathrm{d}\omega_t + a_{t+1}\mathrm{d}\tau_t^A + \tau_t^A\mathrm{d}a_{t+1}$$
$$+ \mathrm{E}[r_t(\theta_t)]\omega_t a_{t+1}\mathrm{d}\tau_t^I + \tau_t^I\mathrm{E}[r_t(\theta_t)]\omega_t\mathrm{d}a_{t+1} + \tau_t^I\mathrm{E}[r_t(\theta_t)]a_{t+1}\mathrm{d}\omega_t. \quad (75)$$

$$\int_\Theta \mathrm{d}G_t f(\theta_t)\mathrm{d}\theta_t = \rho(1-\omega_t)a_{t+1}\mathrm{d}\tau_t^I + \tau_t^I\rho(1-\omega)\mathrm{d}a_{t+1} - \tau_t^I a_{t+1}\rho\mathrm{d}\omega_t + a_{t+1}\mathrm{d}\tau_t^A + \tau_t^A\mathrm{d}a_{t+1}$$
$$+ [\rho+\pi_t]\omega_t a_{t+1}\mathrm{d}\tau_t^I + \tau_t^I[\rho+\pi_t]\omega_t\mathrm{d}a_{t+1} + \tau_t^I[\rho+\pi_t]a_{t+1}\mathrm{d}\omega_t. \quad (76)$$

Simplify:

$$\int_\Theta \mathrm{d}G_t f(\theta_t)\mathrm{d}\theta_t = [\rho+\pi_t\omega_t]a_{t+1}\mathrm{d}\tau_t^I + a_{t+1}\mathrm{d}\tau_t^A + \tau_t^I[\rho+\pi_t\omega_t]\mathrm{d}a_{t+1} + \tau_t^A\mathrm{d}a_{t+1} + \tau_t^I\pi_t a_{t+1}\mathrm{d}\omega_t. \quad (77)$$

Impose $\mathrm{d}\tau_t^A = -\rho\mathrm{d}\tau_t^I$:

$$\int_\Theta \mathrm{d}G_t f(\theta_t)\mathrm{d}\theta_t = \pi_t\omega_t a_{t+1}\mathrm{d}\tau_t^I + (\tau_t^I(\rho+\pi_t\omega_t)+\tau_t^A)\mathrm{d}a_{t+1} + \tau_t^I\pi_t a_{t+1}\mathrm{d}\omega_t. \quad (78)$$

Substitute this in the differentiated value function:

$$\mathrm{d}\mathcal{V}_t(a_t)/u'(c_t) = \int_\Theta \left(\frac{\Gamma'(G_t)}{u'(c_t)} - 1\right)\mathrm{d}G_t f(\theta_t)\mathrm{d}\theta_t + \int_\Theta \mathrm{d}G_t f(\theta_t)\mathrm{d}\theta_t \quad (79)$$
$$= \pi_t\omega_t a_{t+1}\mathrm{d}\tau_t^I + (\tau_t^I(\rho+\pi_t\omega_t)+\tau_t^A)\mathrm{d}a_{t+1} + \tau_t^I\pi_t a_{t+1}\mathrm{d}\omega_t$$
$$+ \int_\Theta \left(\frac{\Gamma'(G_t)}{u'(c_t)} - 1\right)\mathrm{d}G_t f(\theta_t)\mathrm{d}\theta_t.$$

$$\frac{\mathrm{d}\mathcal{V}_t(a_t)/\mathrm{d}\tau_t^I}{u'(c_t)a_{t+1}} = \pi_t\omega_t + \frac{(\tau_t^I(\rho+\pi_t\omega_t)+\tau_t^A)}{1-\tau_t^I}\frac{\mathrm{d}a_{t+1}}{\mathrm{d}\tau_t^I}\frac{1-\tau_t^I}{a_{t+1}} + \frac{\tau_t^I}{1-\tau_t^I}\pi_t\omega_t\frac{\mathrm{d}\omega_t}{\mathrm{d}\tau_t^I}\frac{1-\tau_t^I}{\omega_t} \quad (80)$$
$$+ \frac{1}{a_{t+1}}\int_\Theta \left(\frac{\Gamma'(G_t)}{u'(c_t)} - 1\right)\frac{\mathrm{d}G_t}{\mathrm{d}\tau_t^I}f(\theta_t)\mathrm{d}\theta_t.$$

$$\frac{\mathrm{d}\mathcal{V}_t(a_t)/\mathrm{d}\tau_t^I}{u'(c_t)a_{t+1}} = \pi_t\omega_t - \frac{(\tau_t^I(\rho+\pi_t\omega_t)+\tau_t^A)}{1-\tau_t^I}\varepsilon_{t,a\tau^I} + \frac{\tau_t^I}{1-\tau_t^I}\pi_t\omega_t\varepsilon_{t,\omega\tau^I} \quad (81)$$
$$+ \frac{1}{a_{t+1}}\int_\Theta \left(\frac{\Gamma'(G_t)}{u'(c_t)} - 1\right)\frac{\mathrm{d}G_t}{\mathrm{d}\tau_t^I}f(\theta_t)\mathrm{d}\theta_t.$$

Under the reform, we have that $-\rho\mathrm{d}\tau_t^I = \mathrm{d}\tau_t^A$ joint with $\mathrm{d}G_t \gtrless$ for all θ_t. If this is the case, then we have $\varepsilon_{t,a\tau^I} = 0$ and $\varepsilon_{t,\omega\tau^I} = 1$, so that

$$\frac{\mathrm{d}\mathcal{V}_t(a_t)/\mathrm{d}\tau_t^I}{u'(c_t)a_{t+1}} = \frac{\pi_t\omega_t}{1-\tau_t^I} + \frac{1}{a_{t+1}}\int_\Theta \left(\frac{\Gamma'(G_t)}{u'(c_t)} - 1\right)\frac{\mathrm{d}G_t}{\mathrm{d}\tau_t^I} f(\theta_t)\mathrm{d}\theta_t. \tag{82}$$

References

Abdel-Kader, Khaled and Ruud De Mooij. 2020. "Tax Policy and Inclusive Growth." IMF Working Paper WP/20/271, Washington-DC: IMF.

Atkinson, Anthony B. and Joseph E. Stiglitz. 1980. *Lectures on Public Economics.* London and New York: McGraw-Hill.

Bastani, Spencer and Daniel Waldenström. 2020. "How Should Capital be Taxed?" *Journal of Economic Surveys* 34 (4):812–846.

Boadway, Robin and Pierre Pestieau. 2023. "The Wealth Tax and the Tax Mix." *Canadian Tax Journal* 70 (S):185–208.

Boadway, Robin and Kevin Spiritus. 2024. "Optimal Taxation of Normal and Excess returns to Risky Assets." *Scandinavian Journal of Economics* n/a (n/a).

Boar, Corina and Virgiliu Midrigan. 2023. "Should We Tax Capital Income or Wealth?" *American Economic Review: Insights* 5 (2):259–74.

Christiansen, Vidar. 1993. "A Normative Analysis of Capital Income Taxes in the Presence of Aggregate Risk." *Geneva Papers on Risk and Insurance Theory* 18 (1):55–76.

Cnossen, Sijbren and Bas (eds) Jacobs. 2021. *Tax by Design for the Netherlands.* Oxford University Press.

Domar, Evsey D. and Richard A. Musgrave. 1944. "Proportional Income Taxation and Risk-Taking." *Quarterly Journal of Economics* 58 (3):388–422.

Gerritsen, Aart, Bas Jacobs, Kevin Spiritus, and Alexandra Rusu. 2023. "Optimal Taxation of Capital Income with Heterogeneous Returns to Capital." mimeo: Erasmus University Rotterdam/Vrije Universiteit Amsterdam, Erasmus University Rotterdam.

Gordon, Roger H. 1985. "Taxation of Corporate Capital Income: Tax Revenues Versus Tax Distortions." *Quarterly Journal of Economics* 100 (1):1–27.

Guvenen, Fatih, Gueorgui Kambourov, Burhan Kuruscu, Sergio Ocampo, and Daphne Chen. 2023. "Use It or Lose It: Efficiency and Redistributional Effects of Wealth Taxation." *Quarterly Journal of Economics* 138 (2):835–894.

Guvenen, Fatih, Gueorgui Kambourov, Burhan Kuruscu, and Sergio Ocampo-Diaz. 2024. "Book-Value Wealth Taxation, Capital Income Taxation, and Innovation." NBER Working Paper No. 32585, Cambridge-MA: NBER.

Kaplow, Louis. 1994. "Taxation and Risk Taking: A General Equilibrium Perspective." *National Tax Journal* 47 (4):789–798.

Merton, Robert C. 1969. "Lifetime Portfolio Selection under Uncertainty: The Continuous-Time Case." *Review of Economics and Statistics* 51 (3):247–257.

Saez, Emmanuel, Danny Yagan, and Gabriel Zucman. 2021. "Capital Gains Withholding." mimeo, University of California, Berkeley.

Samuelson, Paul A. 1969. "Lifetime Portfolio Selection By Dynamic Stochastic Programming." *Review of Economics and Statistics* 51 (3):239–246.

Sandmo, Agnar. 1977. "Portfolio Theory, Asset Demand and Taxation: Comparative Statics with Many Assets." *Review of Economic Studies* 44 (2):369–379.

———. 1985. "The Effects of Taxation on Savings and Risk Taking." In *Handbook of Public Economics*, vol. 1, edited by Alan J. Auerbach and Martin Feldstein, chap. 5. Elsevier, 265–311.

Schelderup, Guttorm and Floris T. Zoutman. 2024. "Wealth Taxation: The Key to Unlocking Capital Gains." mimeo: NHH, Norwegian School of Economics.

Scheuer, Florian and Joel Slemrod. 2021. "Taxing Our Wealth." *Journal of Economic Perspectives* 35 (1):207–30.

Schindler, Dirk. 2008. "Taxing Risky Capital Income - A Commodity Taxation Approach." *FinanzArchiv* 64 (3):311–333.

Stiglitz, Joseph E. 1969. "The Effects of Income, Wealth, and Capital Gains Taxation on Risk-Taking." *Quarterly Journal of Economics* 83 (2):263–283.