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Quantitative analysis of a wealth tax for the United States: Exclusions and expenditures☆

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A B S T R A C T

We use a quantitative overlapping generations model with endogenous tax avoidance and rich tax detail to analyze two major issues in the design of a wealth tax for the United States: the provision of exclusions for certain housing and business equity, and the range of government expenditure options allowed for by additional revenues. First, we find that while the exclusion for owner-occupied housing results in quantitatively insignificant macroeconomic and budgetary effects, the exclusion for privately-held noncorporate business equity results in a shift of productive activity towards that sector which can significantly undermine the revenue-raising potential of the tax. Second, we find that the macroeconomic effects of a given wealth tax regime can vary in magnitudes of contraction or expansion depending on the type of expenditures that are assumed to be financed by the additional revenues.

1. Introduction

With the renewed interest for direct taxation of top household wealth in the United States, much attention has been given to analyzing the economic effects of wealth tax proposals, often in comparison to income tax alternatives. This narrow focus has excluded two major issues that policymakers would face when designing a wealth tax regime: (i) the common provision of exclusions from the tax base for owner-occupied housing and privately-held noncorporate business equity that create tax avoidance opportunities;[1,2] and (ii) the various expenditure options that could be financed using the additional revenues generated by the tax. Because these design issues can drive real behavior,[3] a quantitative analysis is critical for understanding the range of possible economic and budgetary outcomes.

In this paper we use a quantitative overlapping generations model calibrated to the United States to simulate variations to a stylized top-wealth tax through exclusion and expenditure alternatives. Two particular features of this framework distinguish our analysis: First, tax avoidance occurs endogenously in the model. Households choose their wealth composition across financial and housing assets, enabling us to endogenously capture household-level avoidance induced by the presence of assets with preferential

☆ This research embodies work undertaken for the staff of the Joint Committee on Taxation, but as members of both parties and both houses of Congress comprise the Joint Committee on Taxation, this work should not be construed to represent the position of any member of the Committee. This work is integral to the Joint Committee on Taxation staff's work and its ability to model and estimate the macroeconomic effects of tax policy changes.

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[1] See OECD (2018) for a summary of assets excluded from wealth tax bases for OECD countries.

[2] We highlight housing and business equity exclusions in particular because they are common due to administrative difficulties, particularly for valuation, Batchelder and Kamin (2019), Kopczuk (2019), Advani et al. (2020), Wetzler (2020), Cochrane (2020), Wolff (2020) and Alstadsæter et al. (2022) or political difficulties (Viard, 2019). Saez and Zucman (2019) discuss proposals to address these difficulties.

[3] See Alvaredo and Saez (2010), Durán-Cabré et al. (2019), and Scheuer and Slemrod (2021).

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tax treatment. Firms operate as publicly-traded corporate and privately-held noncorporate entities, enabling us to endogenously capture firm-level avoidance induced by the presence of an exclusion for noncorporate business equity. Second, we incorporate rich detail pertaining to the underlying federal income tax system by embedding an individual tax calculator within the model. This enables us to capture interaction across tax provisions and carefully account for the budgetary feedback that occurs in general equilibrium.

As a "benchmark" scenario for our analysis, we first consider a broad-based 1% direct tax on household wealth exceeding the top 1% tax-unit threshold, where additional revenues generated by the tax are used to pay down existing federal debt. Holding constant this expenditure assumption, we vary the tax base by providing 'statically revenue-consistent'[4] exclusions for owner-occupied housing and privately-held noncorporate equity, each in turn. Over the transition that follows implementation of a given wealth tax regime, we find that tax avoidance generated by the presence of the housing exclusion results in quantitatively insignificant macroeconomic and budgetary effects, while tax avoidance generated by the noncorporate equity exclusion results in a shift of productive activity from the corporate to noncorporate sector that substantially reduces the revenue-raising potential of the wealth tax. Additionally, we emphasize that this avoidance behavior is distinct from evasion behavior via under-reporting wealth.

Next, we hold constant the broad-based structure of the wealth tax schedule from the benchmark scenario and vary the type of expenditures that are assumed to be financed by the additional revenues generated by the wealth tax regime. Rather than paying down existing federal debt, we allow for four alternative expenditure scenarios:[5] an expansion of the standard deduction within the federal income tax system, a proportional reduction in the federal statutory tax rate schedule for ordinary income, the creation of a Universal Basic Income (UBI) transfer program, and investment in public infrastructure. Over the transition that follows the implementation of a wealth tax regime, we find that the alternative expenditures that have a relatively more positive (negative) effect on aggregate output also have a relatively more positive (negative) effect on the overall federal tax base. These effects are interconnected because a larger tax base generates more revenue to be spent on each expenditure alternative, which further drives the effect on aggregate output.

This paper lies at the intersection of two strands of literature. First, as we quantitatively characterize household-level saving responses to a wealth tax, our paper is related to the applied microeconomic analyses of Alvaredo and Saez (2010), Seim (2017), Durán-Cabré et al. (2019), Jakobsen et al. (2020), Brülhart et al. (2022), and Alstadsæter et al. (2022). Of this group, our analysis is most similar to Jakobsen et al. (2020) through the shared use of structural lifecycle modeling to decompose dynamic behavioral responses across different household groups. However, we echo (Alstadsæter et al., 2022) in highlighting that such behavioral responses are sensitive to the design of the wealth tax.

Second, as we incorporate general equilibrium effects, our paper is also related to the structural macroeconomic simulation analyses of DeBacker et al. (2018), Kaymak and Poschke (2019), Penn-Wharton Budget Model (2020), Diamond and Zodrow (2020), Penn-Wharton Budget Model (2021), Rotberg and Steinberg (2022), and Guvenen et al. (2023). However, this prior work is focused on the effects of alternative statutory wealth tax schedules, and is generally uninformative about how changes to either the wealth tax base or the specified use for additional revenues may affect the economic and budgetary outcomes generated by a new wealth tax regime.[6] None of these papers allow for certain types of wealth to be excluded from the tax base as is often the case in practice, and only in Diamond and Zodrow (2020) (transfers and debt reduction) and Rotberg and Steinberg (2022) (transfers and income tax reduction) are two alternative expenditure assumptions tested for sensitivity. By analyzing practical variations to a wealth tax regime in a systematic fashion, this paper provides a more comprehensive analysis than currently exists in the literature.

We make no attempt to draw normative conclusions about the optimality of a given wealth tax regime in this paper. Rather, our analysis is strictly positive in nature. In our view, characterizing how policy design matters for economic behavior is a requisite step for modeling the efficiency of alternative tax policies because it provides information about what features should be considered in such a normative analysis.

2. The model

The fundamental structure of the model used in this paper is based on Moore and Pecoraro (2021)[7]: Overlapping generations of heterogeneous and finitely-lived households make consumption, labor supply, and residential choices to maximize their lifetime utility. Corporate and noncorporate business entities make labor demand and capital investment choices to maximize firm value. While households and firms directly interact in labor and goods markets, financial intermediaries pool financial wealth from households and allocate these resources into a portfolio of private business equity and debt, as well as public debt issued by the

[4] As specified in Section 4.1.2, static revenue consistency is a condition imposed ex ante on the structure of the wealth tax in each of our simulations for purposes of comparability across scenarios. It requires the amount of wealth tax revenue raised in a single steady state period — without any behavioral changes — to be the same across scenarios.

[5] Recognizing the fungibility of tax revenue, we emphasize that additional revenues must be accounted for by some offsetting change to the government's budget in the form of spending on goods, debt reduction, or even reductions in taxes from other sources. We therefore use 'expenditure' in a broad sense to refer to such budgetary offsets.

[6] While expenditure assumptions have varied across existing macroeconomic analyses, this variation not been systematic. In particular, additional revenues are used for transfers in DeBacker et al. (2018), Rotberg and Steinberg (2022), and Diamond and Zodrow (2020); debt reduction in Penn-Wharton Budget Model (2020, 2021), and Diamond and Zodrow (2020); and income tax reduction in Kaymak and Poschke (2019), Rotberg and Steinberg (2022), and Guvenen et al. (2023).

[7] The model described in the current paper reflects a version of the overlapping generations model built by the authors for use by the Joint Committee on Taxation in providing the United States Congress with macroeconomic analyses of major tax legislation. See Joint Committee on Taxation (2020).

government. The government levies taxes at the household and business levels to finance public consumption, investment, and transfers.

With a top-wealth tax as the object of interest, it is crucial that our model reproduces the observed concentration of household wealth. We therefore adopt the 'capitalist spirit' specification of wealth-in-the utility-function (WIU) introduced by Carroll (2002). Households with WIU receive a 'warm-glow' from their accumulated wealth, as it is a direct argument in their utility function. De Nardi and Fella (2017) demonstrate that the incorporation of utility from wealth resolves some of the difficulties involved with endogenously reproducing realistic wealth concentration within dynamic quantitative models.[8] While it is common to specify a bequest motive for this purpose (DeBacker et al., 2018; Jakobsen et al., 2020), we instead follow Francis (2009) and employ a generalized WIU specification so that we can remain agnostic about the specific reason for WIU to arise.[9]

2.1. Households

The economy is populated by J overlapping generations of finitely-lived households who are ex ante heterogeneous by family composition of single or married $f = \{s, m\}$, ages $j = \{1, \dots, J\}$, and labor productivity types $z = \{1, \dots, Z\}$, and who are ex-post heterogeneous by wealth and by residential status as a homeowner or renter.[10] Working-age households of $j = \{1, \dots, R-1\}$ survive each period with a unitary conditional probability $\pi_{j<R} = 1$, while retired households of $j = \{R, \dots, J\}$ face mortality risk each period with conditional probabilities $0 < \pi_{j>=R} < 1$ and $\pi_J = 0$. In each period t, the measure of households for a given (f, z, j) demographic is denoted by $\Omega^{f,z}_{t,j}$, where the mass of new entrants grows exogenously at the gross rate of Υ_P across periods.

We specify distinct problems for single and married households to capture the dependence of underlying tax provision on family composition. Each household has an associated value function $V^{f,z}_{t,j}$ that is increasing in two endogenous state variables — real financial assets, a_j, and real owner-occupied housing assets, h^o_j — the sum of which is total wealth, $y_j \equiv a_j + h^o_j$. The composition of total wealth across each asset type is thus itself endogenous, which facilitates household-level tax avoidance when either asset becomes relatively more tax-preferred. Instantaneous utility is generated through the function $U^{f,z}_{t,j}$ — which is increasing in a household's real consumption of a composite good x_j, and decreasing in the labor hours n_j of each adult in a household — and through the function O_t — which is increasing and non-homothetic in a household's end-of-period total real wealth, y_{j+1}. The optimization problems for single and married households under a known policy regime are:

$$V^{s,z}_{t,j}(a_j, h^o_j) = \max_{\substack{a_{j+1}, h^o_{j+1}, x_j, \\ n_j \in \mathbb{N}}} U^{s,z}_{t,j}(x_j, n_j) + O_t(y_{j+1}) + \beta \pi_j V^{s,z}_{t+1,j+1}(a_{j+1}, h^o_{j+1}) \tag{2.1}$$

$$V^{m,z}_{t,j}(a_j, h^o_j) = \max_{\substack{a_{j+1}, h^o_{j+1}, x_j, \\ n^1_j, n^2_j \in \mathbb{N}}} U^{m,z}_{t,j}(x_j, n^1_j, n^2_j) + O_t(y_{j+1}) + \beta \pi_j V^{m,z}_{t+1,j+1}(a_{j+1}, h^o_{j+1}) \tag{2.2}$$

where β is a subjective discount factor. The structure of the dynamic programming problems imply that households do not consider the possibility of marriage or divorce. As described in Appendix B.1.1, we nonetheless allow for exogenous age-variation in the measure of single and married households.

We make two key modeling assumptions about choice variables to mitigate the curse of dimensionality. First, we specify that each adult member of a working-age household chooses between part-time work, full-time work, or no work such that $n_j \in \mathbb{N} \equiv \{0, n^{PT}, n^{FT}\}$.[11,12] Because of the operative extensive margin, we incorporate an age-varying fixed utility cost to employment, $F^{f,z}_j(n_j)$. The following functional form for instantaneous utility $U^{f,z}_{t,j}$ is chosen to be consistent with a balanced growth path in the presence of the fixed utility cost:

$$U^{s,z}_{t,j}(x_j, n_j) \equiv \log(x_j) - v^s_j(n_j) - F^{s,z}_j(n_j) \tag{2.3}$$

$$U^{m,z}_{t,j}(x_j, n^1_j, n^2_j) \equiv \log(x_j) - v^m_j(n^1_j, n^2_j) - F^{m,z}_j(n^2_j) \tag{2.4}$$

where $v^f_j(\bullet)$ is a continuous age-varying labor supply disutility function and $F^{f,z}_j(\bullet)$ is a discrete function taking on a positive value only when the single or married-secondary worker is employed. Second, we follow Gervais (2002) and Cho and Francis (2011) in treating the demand for owner-occupied housing as a durable-goods problem where households can costlessly transform the single output good produced by firms into a consumption good, a financial asset, or an owner-occupied housing asset. As described

[8] Alternative methods for endogenously generating realistic wealth concentration include incorporating stochastic earnings with a 'superstar' state (Castañeda et al., 2003), entrepreneurship (Cagetti and De Nardi, 2006), or heterogeneous returns (Hubmer et al., 2020).

[9] While WIU may arise from a bequest motive, it has been argued that WIU may also arise from non-pecuniary benefits of entrepreneurship, social status, or political influence (Saez and Stantcheva, 2018; Michaillat and Saez, 2021).

[10] As described in Appendix B.1.5, we allow households of a given (f, z) demographic to vary by initial wealth endowments $e = \{1, \dots, E\}$. Since household decision rules do not depend on this dimension, we omit indexing by e to reduce notational clutter.

[11] The household federal tax environment described in Section 3.2.1 requires discrete evaluation of tax liabilities at each possible level and composition of income across capital and labor. The indivisible labor supply specification is adopted here to reduce the number of grid point combinations that must be evaluated relative to a continuous labor supply specification.

[12] Under this specification of labor indivisibility, individual labor supply choices follow an implicit reservation wage framework (Chang and Kim, 2006).

in Appendix A, the consumption composite good x_j nests beginning-of-period stock of owner-occupied housing services, among additional consumption variables, in a CES fashion.[13]

The WIU specification is assumed to take the log functional form so that it is consistent with a balanced growth path, and is assumed to be non-homothetic in total wealth as in De Nardi (2004) and Francis (2009):

$$O_t(y_{j+1}) \equiv \log\left(y_{j+1}/o_{t+1} + 1\right) \tag{2.5}$$

where the parameter o_t determines the extent to which wealth is a luxury good, and depends on time only through exogenous growth at the gross rate of technical progress, Υ_A. Because households receive utility from owner-occupied housing assets indirectly through the consumption composite x_j and directly through the function $O_t(y_{j+1})$, a unit of housing assets yield more utility than a unit of financial assets. Housing is thus simultaneously a savings vehicle and a consumption good.

In every period of life, a household's choices are restricted by the following real budget constraint:

$$p_t^x x_j + a_{j+1} + h_{j+1}^o \le (1 + r_t^p)a_j + (1 - \delta^o)h_j^o + inh_{t,j}^{f,z} + i_{t,j}^{f,z} - \mathcal{T}_{t,j}^{f,z} - \xi_j^H \tag{2.6}$$

where variables on the left-hand side are consumption expenditures of the composite good $p_t^x x_j$, end-of-period financial assets a_{j+1} and end-of-period owner-occupied housing assets h_{j+1}^o, and variables on the right-hand side are the gross return to beginning-of-period financial assets $(1 + r_t^p)a_j$, beginning-of-period owner-occupied housing assets net of economic depreciation $(1 - \delta^o)h_j^o$, inheritances $inh_{t,j}^{f,z}$, non-capital income $i_{t,j}^{f,z}$, net tax liabilities $\mathcal{T}_{t,j}^{f,z}$, and housing transaction costs ξ_j^H. Inheritances are generated from the net bequests left from dying households of that same productivity type, but vary across marital status and household age as described in Appendix B.1.4. The housing transaction cost ξ_j^H is positive only when a household chooses to change their residential status from a renter to homeowner, or vice versa.

A household that enters the economy in any given period is assumed to receive an exogenous endowment of financial wealth, but no owner-occupied housing:

$$a_1 = \bar{a}, \quad h_1 = 0 \tag{2.7}$$

We assume that there is an institutional minimum size of owner-occupied housing equal to $\underline{\mathrm{h}}^o$; a household that is unable to afford at least $\underline{\mathrm{h}}^o$ will instead rent housing. In order to purchase a residence, a household must also have a minimum down payment ratio of $1 > \gamma > 0$. As in Gervais (2002), we allow for homeowners to use their property as collateral for borrowing as long as the minimum equity ratio is maintained. Renters are permitted to borrow and have negative total wealth down to an exogenous $\underline{\mathrm{y}}^{f,z} < 0$:

$$a_j \ge \begin{cases} \underline{\mathrm{y}}^{f,z} & \text{if } h_j^o = 0 \\ \max\{\underline{\mathrm{y}}^{f,z}, (\gamma - 1)h_j^o\} & \text{if } h_j^o > 0 \end{cases} \tag{2.8}$$

Non-capital income is equal to labor income during working ages and equal to social security income $ss_j^{f,z}$ during retirement:

$$i_{t,j}^{f,z} \equiv \begin{cases} n_j w_t \mathrm{z}_j^{s,z} + ss_j^{s,z} & \text{if} f = s \\ (n_j^1 + \mu^z n_j^2) w_t \mathrm{z}_j^{m,z} + ss_j^{m,z} & \text{if} f = m \end{cases} \tag{2.9}$$

where w_t is the market real wage rate, $\mathrm{z}_j^{f,z}$ is demographic-specific labor productivity, and $0 < \mu^z \le 1$ is an exogenous productivity wedge between the primary and secondary workers for married households.

A household's total tax liability $\mathcal{T}_{t,j}^{f,z}$ is equal to the sum of the proposed tax liability on wealth, $\mathcal{T}_t^{\boldsymbol{w}}(a_j, h_j^o)$, present-law tax liabilities, $\mathcal{T}_t^{\boldsymbol{i}}(i_{t,j}^{f,z}, r_t^p a_j, h_j^o)$, and applicable estate tax liabilities, $\mathcal{T}_t^{\boldsymbol{e}}(y_{j+1})$, less transfer payments, trs_t:

$$\mathcal{T}_{t,j}^{f,z} = \mathcal{T}_t^{\boldsymbol{w}}(a_j, h_j^o) + \mathcal{T}_t^{\boldsymbol{i}}(i_{t,j}^{f,z}, r_t^p a_j, h_j^o) + \mathcal{T}_t^{\boldsymbol{e}}(y_{j+1}) - trs_t \tag{2.10}$$

Households in the model do not undertake estate planning for tax minimization purposes; the estate of a household that dies at age j is assumed to be apportioned across end-of-life expenditures, c_j^E, estate tax liabilities, $\mathcal{T}_t^{\boldsymbol{e}}(y_{j+1})$, and bequests, beq_j, to be inherited by descendants. The WIU specification used here implies that households receive positive utility from end-of-period wealth in every age of life, including the terminal age J. Should a household die at age $j < J$ because of the mortality risk present in the model, then the amount bequeathed to still-living households is not completely intended. If instead a household dies at the terminal age $j = J$, then amount bequeathed is fully intended. While we do not explicitly model intergenerational linkages, we maintain the assumption that bequests left by each z demographic are aggregated and redistributed as inheritances to working-age households within the same z demographic, and exhibit family composition and age variation, as detailed in Appendix B.1.4. These assumptions imply that the bequest-inheritance structure within the model reinforces wealth concentration.

[13] The composite consumption good x_j nests endogenous quantities for consumption of market goods, housing services from an owner-occupied housing or rental unit, child-care, services produced at home, and charitable giving. This consumption detail is incorporated in the model so that we can capture the incentives of tax-preferred consumption choices and the effects of child-rearing on lifecycle labor supply. For purposes of exposition, we explain this consumption detail in Appendix A.

2.2. Firms

Output of the numéraire good is produced by firms across two perfectly competitive sectors — corporate and noncorporate, $q = c, n$ — and can be transformed by economic agents into consumption goods and services or investment assets. Firms finance investment in capital K_t^q using a combination of bonds and equity obtained from the financial market, hire labor input N_t^q from perfect labor markets, and use these inputs to produce output Y_t^q at value maximizing levels. The primary differences between firms in the corporate and noncorporate sector are in terms of tax treatment, the distribution of profits, and new equity share issuance.

We define the real after-tax return on the equity value of the representative firm in each sector, $R_t^q V_t^q$, as the sum of aggregate net capital gains and net income to the marginal investor-household:

$$V_t^c R_t^c = (1 - \tau_t^g) gns_t^c + (1 - \tau_t^d) div_t \tag{2.11}$$

$$V_t^n R_t^n = (1 - \tau_t^g) gns_t^n + dst_t - txl^n \tag{2.12}$$

where τ_t^g is the aggregate accrual-equivalent tax rate on capital gains gns_t^q, τ_t^d is an aggregate EMTR on corporate dividends div_t, and txl^n is the tax liability on noncorporate distributions dst_t.[14] Pretax capital gains are equal to the change in firm value:

$$gns_t^c = V_{t+1}^c - V_t^c - shr_t \tag{2.13}$$

$$gns_t^n = V_{t+1}^n - V_t^n \tag{2.14}$$

where the corporate firm is assumed to be publicly traded so that it can issue or buy back shares of equity shr_t, and the noncorporate firm is assumed to be privately held so that it cannot issue or buy back equity shares.[15]

The objective function for the representative firm in each sector can be obtained by substituting Eqs. (2.13) and (2.14) into Eqs. (2.11) and (2.12) respectively, rearranging for V_t^q, and solving forward:

$$V_t^c(K_t^c) = \max_{N_t^c, K_{t+1}^c} \frac{(1 - \tau_t^d) div_t - (1 - \tau_t^g) shr_t}{(R_t^c + 1 - \tau_t^g)} + \beta_t^c V_{t+1}^c (K_{t+1}^c) \tag{2.15}$$

$$V_t^n(K_t^n) = \max_{N_t^n, K_{t+1}^n} \left(\frac{dst_t - txl^n}{R_t^n + 1 - \tau_t^g} \right) + \beta_t^n V_{t+1}^n (K_{t+1}^n) \tag{2.16}$$

where $\beta_t^q \equiv \frac{(1-\tau_t^g)}{(R_t^q + 1 - \tau_t^g)}$ for $q = c, n$. Each firm is constrained by:

1. the cash flow restriction:

$$ern_t^c + B_{t+1}^c - B_t^c + shr_t = div_t + I_t^c + txl_t^c \tag{2.17}$$

$$ern_t^n + B_{t+1}^n - B_t^n = dst_t + I_t^n \tag{2.18}$$

2. the law of motion for capital:

$$K_{t+1}^q = (1 - \delta^K) K_t^q + I_t^q - \Xi_t^q \quad \text{for } q = c, n \tag{2.19}$$

where δ^K is the economic rate of depreciation on private capital and Ξ_t^q is an investment adjustment cost function.

3. the debt issues rule:

$$B_t^q = \varkappa^{b,q} K_t^q \quad \text{for } q = c, n \tag{2.20}$$

where $\varkappa^{b,q}$ is time-invariant debt-to-capital ratio and B_t^q is the beginning-of-period stock of net debt held by the representative firm in sector.

4. the dividend payout rule for the corporate firm in Eq. (2.21) described below.

The corporate firm's cash-flow restriction in Eq. (2.17) states that contemporaneous inflows — earnings ern_t^c, new debt issues $B_{t+1}^c - B_t^c$, and new share issues shr_t — must be equal to outflows — dividend payments div_t, investment in productive capital I_t^c, and tax liabilities txl_t^c. As in Zodrow and Diamond (2013), we assume that the corporate dividends are an exogenous fraction $\varkappa^d$ of after-tax earnings:

$$div_t = \varkappa^d (ern_t^c - txl_t^c) \tag{2.21}$$

The noncorporate firm's cash-flow restriction in Eq. (2.18) differ from that of the corporate firm to the extent that noncorporate firms do not issue new equity shares and do not directly remit tax liabilities to the government.[16] Although the noncorporate firm

[14] The aggregate EMTR on equity wealth does not directly appear in Eqs. (2.11) and (2.12) due to our assumption that only the principle — rather than the principle and return on wealth — is taxed as in Eq. (4.1). Nonetheless, the implied equilibrium values of R_t^q will be affected by the presence of a wealth tax as given by Eq. (2.29).

[15] Since we do not model privately-held corporate entities or publicly-held noncorporate entities, avoidance on the public–private margin is the same as avoidance on the corporate-noncorporate margin.

[16] This assumption reflects the current tax treatment of noncorporate entities in the United States.

internalizes the tax liabilities generated by its activity into its own value as specified in Eq. (2.16), the tax liabilities are ultimately remitted to the government by investor-households. As described in Section 2.3, pretax noncorporate distributions dst_t are passed through to the household-level where they are taxed jointly with other household income.

Earnings for firms in both sectors are defined as production of output, Y_t^q, less wages paid to labor input, $w_t N_t^q$ and interest paid on debt $i_t B_t^q$:

$$ern_t^q \equiv Y_t^q - w_t N_t^q - i_t B_t^q \quad \text{for} \quad q = c, n \tag{2.22}$$

Output is produced using constant returns to scale, Cobb–Douglas technology:

$$Y_t^q = Z^q (G_t)^g (K_t^q)^\alpha (A_t N_t^q)^{1-\alpha-g} \quad \text{for } q = c, n \tag{2.23}$$

where G_t is beginning-of-period public capital from the government, K_t^q and N_t^q are beginning-of-period productive private capital and effective labor employed in each sector, Z^q is a scale parameter, and A_t is labor-augmenting technology that evolves identically within each sector according to $A_{t+1} = Y_A A_t$. The decreasing returns to scale for private factors of production allows for an interior solution with the two sector - single output good framework. In addition, the public factor input along with perfect financial and labor markets leads to economic rents which are fully captured by firms.

2.3. Financial intermediaries

While we allow for each household to directly choose the allocation of their wealth between real and financial assets, all financial assets are pooled into an investment fund that is allocated by financial intermediaries into a portfolio that is optimal in the aggregate.[17] We follow Gervais (2002) and Cho and Francis (2011) in specifying an overlapping generations structure of perfectly competitive, two-period-lived financial intermediaries:[18] In the first period of a representative financial intermediary's life, it collects end-of-period savings from living households as deposits, D_{t+1}, and chooses a portfolio that consists of corporate and noncorporate equity V_{t+1}^c and V_{t+1}^n, corporate and noncorporate bonds B_{t+1}^c and B_{t+1}^n, domestically-held government bonds B_{t+1}^G, and rental housing H_{t+1}^r. In the second period of its life, a representative financial intermediary passes the pretax portfolio returns $r_{t+1}^p D_{t+1}$ back to households and transfers its remaining assets to a new representative financial intermediary which repeats this process.

There is assumed to be no investment risk so that the real returns of each investment vehicle are known with certainty. First, corporate and noncorporate equity pays dividends div_{t+1} and distributions dst_{t+1}, and accrues capital gains gns_{t+1}^c and gns_{t+1}^n. Second, corporate and noncorporate bonds yield a pretax rate of return of i_{t+1}, while government bonds yield a low, "safe" pretax rate of return ρ_{t+1}, which depends positively on both the private bond rate and the total public debt-output ratio:

$$\rho_{t+1} = \varpi i_{t+1} + \varsigma \exp\left(\frac{B_{t+1}^{G,tot}}{Y_{t+1}}\right) \quad \forall t \tag{2.24}$$

Finally, it is assumed that financial intermediaries have access to technology that can transform deposits into rental housing services. The stock of rental housing services held by a financial intermediary are rented out to households at a price of p_{t+1}^r and depreciate at rate δ^r. The total income received by a representative financial intermediary from its portfolio allocation can be summarized as:

$$Inc_{t+1} \equiv div_{t+1} + dst_{t+1} + gns_{t+1}^c + gns_{t+1}^n + (p_{t+1}^r - \delta^r)H_{t+1}^r + \rho_{t+1}B_{t+1}^G + i_{t+1}(B_{t+1}^c + B_{t+1}^c) \quad \forall t \tag{2.25}$$

Formally, the maximization problem for a representative financial intermediary is:

$$\max_{\substack{V_{t+1}^c, V_{t+1}^n, \\ B_{t+1}^c, B_{t+1}^n, H_{t+1}^r}} \quad Inc_{t+1} - r_{t+1}^p D_{t+1} \tag{2.26}$$

subject the financial market resource constraint:

$$D_{t+1} = V_{t+1}^c + V_{t+1}^n + B_{t+1}^G + B_{t+1}^c + B_{t+1}^n + H_{t+1}^r \quad \forall t \tag{2.27}$$

Perfect competition in the financial market implies a zero-profit condition each period so that households receive a pretax portfolio rate of return on their deposits equal to:

$$r_{t+1}^p = \frac{Inc_{t+1}}{D_{t+1}} \quad \forall t \tag{2.28}$$

which is equivalently the borrowing rate for households with mortgages or consumer debt. For the portfolio allocation to be optimal in the aggregate, the average tax consequences of households must be internalized by financial intermediaries. The no-arbitrage condition will therefore reflect equalization of the aggregate after-tax marginal rates of return across investment vehicles:

$$R_{t+1}^c - \tau_{t+1}^{cw} = R_{t+1}^n - \tau_{t+1}^{nw} = (1 - \tau_{t+1}^i)i_{t+1} - \tau_{t+1}^{bw} = (1 - \tau_{t+1}^r)(p_{t+1}^r - \delta^r) - \tau_{t+1}^{rw} \quad \forall t \tag{2.29}$$

[17] This structure is adopted for computational simplicity, as allowing for households to directly choose their financial asset portfolio would require an additional five state variables for the households' problem.

[18] The financial intermediary's problem could be alternatively specified over an infinite horizon, as in Moore and Pecoraro (2020b). This structure would yield a comparable no-arbitrage condition depending on financial intermediary's discount factor.

where R^c_{t+1} and R^n_{t+1} are the rates of return to corporate and noncorporate equity net of income taxes, τ^i_{t+1} and τ^r_{t+1} are aggregate EMTRs on interest and rental income, and τ^{cw}_{t+1}, τ^{nw}_{t+1}, τ^{bw}_{t+1}, τ^{rw}_{t+1} are aggregate EMTRs on corporate and noncorporate equity wealth, bond wealth, and rental housing wealth.

2.4. Government

The government collects taxes from households and firms, T_t, issues bonds $B^{G,tot}_{t+1} - B^{G,tot}_t$ to finance public consumption, C^G_t, productive capital expenditures, I^G_t, and transfer payments to households TR_t. The recursive budget constraint of the consolidated[19] federal and state-local government can then be expressed as:

$$I^G_t + C^G_t + TR_t \leq T_t + B^{G,tot}_{t+1} - (1+\rho_t)B^{G,tot}_t \tag{2.30}$$

While government consumption is assumed to be non-valued by households, public capital is assumed to be productive as specified in Eq. (2.23). To account for the time-to-build properties of public capital (Ramey, 2020; Leeper et al., 2010), the law of motion for public capital follows:

$$G_{t+1} = (1-\delta^g)G_t + \sum_{s=1}^{S} \kappa^{TTB}_s I^G_{t-s+1} \tag{2.31}$$

where δ^g is the rate of economic depreciation on public capital, S is the number periods it takes for public capital investment to become fully productive, and $\sum_{s=1}^{S} \kappa^{TTB}_{s-1} = 1$.

Total taxes collected by the consolidated government include liabilities from households, txl^{hh}_t, estates, txl^{est}_t, and corporations, txl^c_t:

$$T_t \equiv txl^{hh}_t + txl^{est}_t + txl^c_t \tag{2.32}$$

where:

$$txl^{hh}_t = \int_{\mathbb{Z}}\int_{\mathbb{J}} \sum_{f=s,m} \left(\mathcal{T}^{\mathbf{i}}_t(i^{f,z}_{t,j}, r^p_t a_j, h^o_j) + \mathcal{T}^{\mathbf{w}}_t(h^o_j, a_j) \right) \Omega^{f,z}_{t,j}\ dj\ dz \tag{2.33}$$

$$txl^{est}_t = \int_{\mathbb{Z}}\int_{\mathbb{J}} (1-\pi_j) \sum_{f=s,m} \mathcal{T}^{\mathbf{e}}_t(y_{j+1}) \Omega^{f,z}_{t,j}\ dj\ dz \tag{2.34}$$

and txl^c_t is defined in Section 3.2.2.

In addition to social security payments to retirees, $ss^{f,z}_{t,j}$, households receive lump-sum transfer payments from the government, trs_t. Aggregate government transfers therefore can be expressed as:

$$TR_t = \int_{\mathbb{Z}}\int_{\mathbb{J}} \sum_{f=s,m} \left(ss^{f,z}_{t,j} + trs_t \right) \Omega^{f,z}_{t,j}\ dj\ dz \tag{2.35}$$

To capture partial financing of budget deficits by foreign agents, we assume that domestic agents only purchase an exogenous fraction of total new public debt issued:

$$B^G_{t+1} - B^G_t = \kappa^{dom}(B^{G,tot}_{t+1} - B^{G,tot}_t) \tag{2.36}$$

where it is implied that foreign agents outside the model purchase the residual. This partially-open-economy specification reduces the sensitivity of the model to 'crowding-out' or 'crowding-in' effects following large changes to public debt. We rule out explosive and implosive debt paths by maintaining the no-Ponzi condition:

$$\lim_{k\to\infty} \frac{B^{G,tot}_{t+k}}{\prod_{s=0}^{k-1}(1+\rho_{t+s})} = 0 \tag{2.37}$$

which implies that the current stock of net debt is equal to the present-discounted value of all future primary surpluses along any equilibrium path.

2.5. Equilibrium

Equilibrium is informally defined as a collection of decision rules that are the solutions to households' and firms' optimization problems; a collection of economic aggregates that are consistent with household and firm behavior; a collection of prices that facilitate cross-sector factor-price equalization and clearing in factor, asset, and goods markets; and an associated set of policy aggregates that are consistent with government budget constraints. Equilibrium is formally defined in Appendix C in terms of a trend-stationary transformation of the model.

[19] The federal and state-local governments are consolidated for exposition purposes. While state-local government policy variables are held constant in our simulations, we incorporate state-local taxes to account for their distortionary impact on behavior, and we incorporate state-local public capital to account for the positive impact on private factor productivity. As described in Section 3.2 and Appendix B.2.5, we internally account for federal variables separately from state-local variables so that we can describe the budgetary effects at the federal level in our simulations.

Table 1
Select exogenous parameters and steady state moments.

	Parameter	Value	Moment	Target	Actual
Preferences					
Subjective discount factor	β	0.940	Wealth-Income Ratio	5.05	5.11
WIU parameter	o_t/A_t	350	Top-1% Wealth Concentration	35.9%	35.9%
Continuous labor supply disutility	$v_j^{f,z}(\bullet)$	Eq. (3.1)	Table 2		
Discrete labor fixed utility cost	$F_j^{f,z}(\bullet)$	Eq. (3.2)	Table 2		
Production					
Private capital share of output	α	0.353	Eqs. (3.3)–(3.4)		
Public capital share of output	g	0.078	Eqs. (3.3)–(3.4)		
Private capital depreciation rate	δ^K	0.0799	Private Inv.-Capital Ratio	0.099	0.098
Output scale parameter	Z^c, Z^n	1.045, 1.00	Corp.-Tot. Gross Receipts Ratio	0.692	0.690
Corporate firm debt-capital ratio	$\varkappa^{b,c}$	0.315	Int. Expense-GDP Ratio	0.039	0.039
Noncorporate firm debt-capital ratio	$\varkappa^{b,n}$	0.055	Int. Expense-GDP Ratio	0.003	0.003
Corporate dividend payout ratio	$\varkappa^d$	0.130	Net Corp. Dividends-GDP Ratio	0.031	0.031
Housing					
Owner-occupied housing minimum	$\underline{h}^o$	0.925	Homeownership Ratio	0.637	0.640
Owner-occupied housing depreciation rate	δ^o	0.0662	Owner-Occupied Inv.-Capital Ratio	0.084	0.085
Rental housing depreciation rate	δ^r	0.1230	Tenant-Occupied Inv.-Capital Ratio	0.143	0.142

3. Calibration

The initial steady state balanced growth path is calibrated at an annual frequency to approximate the 2017 economic environment and tax law, which is the baseline against which our policy experiments are measured.[20] The choice of parameter values largely follows from Moore and Pecoraro (2021), which makes use of long-run historical data, recent observations, micro-studies, and projections. In particular, most projections used in our calibration procedure are either obtained from the Joint Committee on Taxation's Individual Tax Model ("JCT-ITM")[21] or *The Budget and Economic Outlook: 2018 to 2018* from the Congressional Budget Office ("CBO"). In the following sections, we describe the initial steady state calibration procedure for key household, firm and residential non-tax parameters, as well as the structure of the underlying present-law tax system. Non-tax parameter values and associated steady state targets are summarized in Table 1, while properties of the federal income tax system are summarized in Tables 3–5. Appendix B describes the calibration procedure for parameters not described below.

[20] In doing so, we do not incorporate the tax provisions contained in PL 115–97, also known as the 'Tax Cuts and Jobs Act', or the economic consequences of the Covid-19 pandemic and related policy measures such as the CARES Act of 2020, the Consolidated Appropriations Act of 2021, the American Rescue Plan of 2021, or the Inflation Reduction Act of 2022.

[21] Joint Committee on Taxation's Individual Tax Model is in principle similar to NBER's TAXSIM model. However, while TAXSIM makes use of the Statistics of Income ("SOI") division public use files, the JCT-ITM generally uses a more recent, confidential sample of tax returns from the SOI division that contains a broader set of variables than do the public use data. For more information, see Joint Committee on Taxation (2015).

Table 2
Baseline employment status by type of worker.

	Data (MEPS)			Model		
Type of worker	FT	PT	U	FT	PT	U
Single	0.61	0.24	0.15	0.61	0.24	0.15
Married Primary	0.90	0.08	0.02	0.90	0.10	0.00
Married Secondary	0.42	0.32	0.26	0.42	0.33	0.25

3.1. Non-tax parameters

3.1.1. Households

We use two preference parameters — households' subjective discount factor, β, and the wealth-in-utility (WIU) parameter, o_t — in targeting the estimated values of aggregate household wealth and top wealth shares.[22] First, we set $\beta = 0.940$ to target an aggregate wealth to income ratio of 5.05 within the model.[23] Second, assuming that o_t grows at the gross rate of technological progress, we set $o_t/A_t = 350$ to target a top-1% wealth concentration target of 0.359, which is the midpoint between the values estimated by Smith et al. (2023) and Saez and Zucman (2020a).

Preferences for labor supply are given by the continuous disutility function, $v_j^f(\bullet)$, and the discrete fixed utility cost function, $F_j^{f,z}(\bullet)$. So that our model exhibits plausible employment properties over the lifecycle and in the aggregate under our indivisible labor framework, we incorporate sources of reservation wage heterogeneity related to child-rearing.[24] We do so by allowing labor supply preferences to depend on the average number household dependents under the age of 6 for a given (f, z, j) demographic, $dep_j^{f,z}$, which are calculated using the JCT-ITM for 2017. First, the labor disutility function $v_j^f(\bullet)$ is assumed to take the form:

$$v_j(n_j) = \begin{cases} \psi^s \frac{(n_j+\varphi_j^{s,z})^{1+\zeta^s}}{1+\zeta^s} & f = s \\ \psi^{m,1} \frac{(n_j^1)^{1+\zeta^{m,1}}}{1+\zeta^{m,1}} + \psi^{m,2} \frac{(n_j^2+\varphi_j^{m,z})^{1+\zeta^{m,2}}}{1+\zeta^{m,2}} & f = m \end{cases} \tag{3.1}$$

where $\varphi_j^{f,z}$ is an exogenous, age-varying time-use term for child-rearing that is independent of work hours in the spirit of Guner et al. (2012, 2020), which has the effect of increasing the disutility for labor over ages which the number of children is relatively high. We set $\varphi_j^{f,z} = 0.094 dep_j^{f,z}$ so that parents spend about 520 h per child each year (Hotz and Miller, 1988), which is broadly consistent with the time-use specified by Guner et al. (2012). Second, the fixed utility cost takes the form:

$$F_j^{f,z}(n_j) = \begin{cases} (1 + dep_j^{f,z})\phi^s \boldsymbol{I}(n_j > 0) & f = s \\ (1 + dep_j^{f,z})\phi^m \boldsymbol{I}(n_j^2 > 0) & f = m \end{cases} \tag{3.2}$$

where $\boldsymbol{I}(\bullet)$ is an indicator function that equal to one only if labor supply of a single worker or married secondary worker is positive. Given these two functions, the parameter sets $\{\zeta^s, \zeta^{m,1}, \zeta^{m,2}\}$, $\{\psi^s, \psi^{m,1}, \psi^{m,2}\}$, and $\{\phi^s, \phi^m\}$ fully specify labor supply preferences. The first set of parameters are exogenously set to the relatively high values of $\zeta^s = \zeta^{m,1} = \zeta^{m,2} = 5$, which implies that fluctuations to aggregate employment will depend relatively more heavily on changes to duration of working life than changes to hours worked while employed (Keane and Rogerson, 2012).[25,26] The second and third sets of parameters are calibrated internally to target the distribution of employment statuses across earner types observed in the Medical Expenditures Panel Survey for 2015,[27] the fit of which is reported in Table 2.

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[22] To be consistent with our targets, we exclude the implicit portion of housing wealth in our model that represents consumer durables when these computing figures. We approximate consumer durables as 28.3% of housing assets in our model, which is the average share of consumer durables in the stock of residential capital over 2007–2016 as measured by the Bureau of Economic Analysis (BEA).

[23] The numerator of this target is based on a value for aggregate household wealth in 2016 of $80.90 trillion from Smith et al. (2023), which is their 'spec #9' less their estimated value of unfunded pensions, which most closely the matches the definition of wealth used in our model. The denominator of this target is BEA's estimated value for 2016 national income of $16.03 trillion.

[24] In Appendix A, we describe how our nested consumption detail incorporates interaction between child-care expenditures and employment.

[25] In our specification of indivisible labor supply, Chang et al. (2011) show that these curvature parameters are largely independent of the underlying Frisch labor supply elasticities, which are endogenous and can differ across worker types despite the same curvature parameter values.

[26] In a similar indivisible labor choice framework, Chang and Kim (2006) show that the aggregate labor elasticity is determined endogenously by the distribution of reservation wages, rather than by exogenous parameters.

[27] We use the Medical Expenditures Panel Survey because market work hours are reported for both individuals in a married couple, and therefore allows for us to avoid erroneously using gender as a proxy for primary or secondary earners. We consider full-time work to correspond with hours greater than or equal to 35 per week, and part-time work to correspond with positive hours less than 35 per week.

Table 3
Baseline average adjusted gross labor income and federal labor income tax liabilities (in thousands of 2018$).

	Income				Taxes			
	Target	Model	Target	Model	Target	Model	Target	Model
Productivity	Single		Married		Single		Married	
1	3.0	3.0	16.8	16.8	−0.4	−0.4	−2.8	−2.8
2	15.0	15.1	52.0	51.9	−2.5	−2.5	0.1	0.1
3	28.5	28.6	83.3	83.4	−0.2	−0.2	5.4	5.4
4	44.6	44.4	123.3	123.8	3.0	3.0	12.2	12.4
5	64.8	64.9	176.1	176.9	6.8	6.9	23.8	23.9
6	105.8	105.8	318.7	319.9	15.6	15.5	64.5	64.7
7	276.8	278.1	1,459.6	1,466.7	61.0	60.9	409.7	410.8
8	1,450.7	1,451.8	5,522.6	5.522.3	419.2	419.5	1,776.1	1,774.3

Table 4
Baseline average adjusted gross capital income (in thousands of 2018$).

	Working-age				Retired			
	Target	Model	Target	Model	Target	Model	Target	Model
Percentile	Single		Married		Single		Married	
0 – 20	0.0	0.0	0.0	0.0	0.3	0.0	1.6	0.0
20 – 40	0.0	0.0	0.0	0.0	1.6	1.6	7.7	7.1
40 – 60	0.0	0.0	0.0	0.0	7.0	7.0	24.0	23.9
60 – 80	0.0	0.0	1.4	1.4	21.5	21.4	48.9	48.6
80 – 90	0.8	0.8	7.9	7.8	43.2	43.0	83.9	83.5
90 – 99	9.9	9.9	73.0	72.5	93.0	92.5	165.5	164.6
99 – 99.9	129.8	129.0	770.4	766.3	330.6	329.1	628.8	625.4
99.9 – 100	2,469.2	2,470.8	1,013.3	1,013.2	2,594.2	2,603.5	4,938.2	4,947.8

Table 5
Baseline aggregate tax ratios.

As percent of aggregate output	Target	Model
Noncorporate Income Tax Revenue	1.36	1.36
Dividend Tax Revenue	0.21	0.21
Interest Income Tax Revenue	0.08	0.09
Capital Gains Tax Revenue	0.67	0.68
FICA/SECA Tax Revenue	4.38	4.38
Medicare Tax Revenue	1.34	1.34
Estate Tax Revenue	0.12	0.12
Corporate Income Tax Revenue	1.68	1.68

3.1.2. Firms and housing

Production shares for private capital, α, and public capital, g, are exogenously calibrated to satisfy two conditions:

$$1 - \alpha - g = 0.569 \tag{3.3}$$

$$\left(\frac{g \times 1.566}{\alpha \times 0.808}\right) = 0.431 \tag{3.4}$$

The first condition implies that labor's share of output will be equal to 0.569, which is the value estimated by Penn World Tables (Feenstra et al., 2015) for 2017. The second condition implies that the relative marginal productivity of public capital to private capital will be 0.431, given targets for the output to non-residential public capital ratio and output to non-residential private capital ratio of 1.566 and 0.808 as reported by NIPA for years 2007–2016 on average.[28] These conditions are satisfied with $\alpha = 0.353$ and $g = 0.078$, the latter of which is at the lower end of the ranges preferred by Ramey (2020) and Bom and Ligthart (2014).

Since the aggregate laws of motion for all forms of capital in our model follow the same structure, rates of economic depreciation δ^{κ} for $\kappa = K, o, r$ are computed to satisfy the same steady state expression for the aggregate investment to capital ratio, $\iota^{\kappa} =$

[28] The target of 0.431 for the relative marginal productivity of public capital to private capital is based on the methodology of Congressional Budget Office (2016), but adjusted here for the exclusion of residential capital.

$(\Upsilon_A \Upsilon_P - 1 + \delta^\kappa)$.[29] Using the average annual investment flows and stocks of private non-residential fixed assets as reported by NIPA for years 2007–2016 yields $\delta^K = 0.0799$. Using the average annual investment flows and stocks of private residential fixed assets and consumer durables as reported by NIPA over the same period, we obtain $\delta^o = 0.0662$ for owner-occupied fixed assets and $\delta^r = 0.1230$ for tenant-occupied fixed assets.

We assume that firms face adjustment costs when they deviate from the steady state investment-capital ratio. Adjustment costs are assumed to be convex cost and given by the function:

$$\Xi_t^q = \frac{\xi^K}{2}\left(\frac{I_t^q}{K_t^q} - \Upsilon_P \Upsilon_A + 1 - \delta^K\right)^2 K_t^q \quad \text{for } q = c, n$$

Given the rates of population growth technological progress and economic depreciation, this adjustment cost function is parameterized by ξ^K, which for purposes of the simulations is set to 6.

We target the relative size of output produced by the corporate and noncorporate sector by making use of time-invariant scale parameters Z^q for $q = c, n$ on the firms' production functions. We set $Z^c = 1.045$ and $Z^n = 1$ to target the ratio of corporate gross receipts to total business gross receipts equal to 0.692 as computed from the SOI for 2016. Corporate and noncorporate representative firms are assumed to maintain constant debt to capital ratios of $\varkappa^{b,c} = 0.315$ and $\varkappa^{b,n} = 0.055$, which target sector-specific interest expense to aggregate output ratios of 0.039 and 0.003 as computed from the SOI and NIPA for 2016. In addition, the corporate firm distributes dividends to households as a $\varkappa^d$ portion of after-tax earnings. We set this parameter to $\varkappa^d = 0.130$, which targets the ratio of net dividends of domestic C-corporations to aggregate output of 0.031 as measured by NIPA for 2016.

Following Gervais (2002), Fernánez-Villaverde and Krueger (2010), and Cho and Francis (2011), we set the minimum owner-occupied housing equity to $\gamma = 0.20$.[30] Similarly, we assume that there is a lower bound on the support of owner-occupied housing $\underline{h}^o$, and calibrate its value internally to target a homeownership ratio of 0.637 as reported for 2015 by the *American Housing Survey*. Finally, we assume that housing transaction costs take the form:

$$\xi_j^H = \begin{cases} \phi^o h_{j+1}^o & \text{if } h_j^o = 0 \\ \phi^r h_{j+1}^r & \text{if } h_j^o > 0 \end{cases} \tag{3.5}$$

where h_{j+1}^r is the quantity of housing rented by a household. In contrast to Cho and Francis (2011), where housing transaction costs are triggered when housing size changes across periods, we specify that they are triggered only when residential status changes from a renter to owner (or vice versa). We do this because our definition of housing services includes the stock of consumer durable goods, which would not be subject to transaction costs for infinitesimal changes. Based on Gruber and Martin (2003), we assume symmetric transaction costs and set $\phi^o = \phi^r = 0.05$.

3.2. Present-law taxation

3.2.1. Households

Each household is assumed to be a single tax unit. Present-law tax liabilities for a given living household, $\mathcal{T}_t^i(i_{t,j}^{f,z}, r_t^p a_j, h_j^o)$, is composed of federal income taxes, $fit_{t,j}^{f,z}$, federal payroll taxes, $prt_{t,j}^{f,z}$, and state-local income and property taxes, $slt_{t,j}^{f,z}$:

$$\mathcal{T}_t^i(i_{t,j}^{f,z}, r_t^p a_j, h_j^o) = fit_{t,j}^{f,z} + prt_{t,j}^{f,z} + slt_{t,j}^{f,z}$$

where state-local taxes are described in Appendix B.2.3.[31] Because the starting point for determining a household's tax base, adjusted gross income (AGI), differs from measures of economic income produced by the Bureau of Economic Analysis (Ledbetter, 2007), household income variables subject to taxation must be adjusted within the model. While this process is described in Appendix B.2.1, the left panel of Tables 3 and 4 show that the portion of AGI attributed to labor and capital respectively closely match their corresponding empirical values.

Federal income taxes, $fit_{t,j}^{f,z}$, are determined using the Moore and Pecoraro (2021) internal tax calculator framework,[32] which is a mapping from a household's AGI to their federal income tax liabilities that explicitly models major statutory individual tax provisions of the Internal Revenue Code.[33] In contrast to smooth tax functions that abstract from tax detail as in Guner et al. (2014), the internal tax calculator framework accounts for the joint taxation of ordinary capital and labor income, the special taxation of preferential capital income, as well as credits and deductions that depend on households' tax-preferred consumption choices and

[29] Economic depreciation for public capital follows a similar calibration scheme as described in Appendix B.2.6.

[30] This closely corresponds to the median loan-to-value ratio of 77% for owner-occupied housing units manufactured between 2010–2015 as reported in the Census Bureau's 2015 *American Housing Survey*.

[31] While the effect on state-local tax variables are not shown in our simulation results, they are included in the model to capture the distortionary effects that they may have on decision making.

[32] The internal tax calculator framework was developed for purposes of incorporating a high-level of individual tax detail within the macroeconomic analyses produced by the Joint Committee on Taxation for major tax legislation. See equations (36)-(43) of Moore and Pecoraro (2021) for a detailed specification.

[33] The tax calculator explicitly models the following provisions as specified in the Internal Revenue Code for 2017: *the statutory tax rate schedule for ordinary income, statutory tax rate schedule for preferential income, special treatment of social security income, net investment income surtax, additional medicare tax, personal and dependent exemptions, standard deduction, home mortgage interest deduction, state-local income, sales, and property tax deductions, charitable giving deduction, earned income credit, child tax credit, and the dependent care credit*. See Joint Committee on Taxation (2017) for an overview of the 2017 federal tax system.

family composition. In addition, this framework allows us to decompose tax liabilities on household income across different types of income, which is crucial in this analysis for understanding the general equilibrium budgetary feedback effects that arise due to structure of the underlying income tax system.[34] The right panel of Table 3 shows the amount of tax liabilities attributed labor income over the income distribution in the initial steady state, while the top panel of Table 4 shows the amount of tax liabilities attributed to each type of capital income relative to aggregate output in the initial steady state.

Federal Payroll taxes, $prt_{t,j}^{f,z}$, are a household's Federal Insurance Contributions Act (FICA) and Self Employment Contributions Act (SECA) contributions for the Old Age, Survivors, and Disability Insurance (OASDI) program, and their contributions for the Medicare program. So that we can properly account for the individual-level taxable maximum income threshold for FICA/SECA contributions, we assume that both the employee- and employer-portion are combined and remitted by households. In 2017, combined FICA/SECA contributions are 12.4% of covered-wages up to a threshold of $\bar{\mathcal{O}} = \$127,200$ for the OASDI program, and 2.9% of uncapped covered-wages for the Medicare program.[35] Unlike the federal income tax, which treats income from spouses filing a joint return as a single base, the payroll tax base for each spouse is independent. Therefore:

$$prt_{t,j}^{f,z} = \begin{cases} 0.124 \times \chi^{\mathcal{O}} \times \min\left(n_j w_t \mathrm{z}_j^{s,z}, \bar{\mathcal{O}}\right) + 0.029 \times \chi^{\mathcal{MED}} i_{t,j}^{s,z} & \text{for } f = s,\ j < R \\ 0.124 \times \chi^{\mathcal{O}} \times \left(\min\left(n_j^1 w_t \mathrm{z}_j^{m,z}, \bar{\mathcal{O}}\right) + \min\left(\mu^z n_j^2 w_t \mathrm{z}_j^{m,z}, \bar{\mathcal{O}}\right)\right) & \\ \qquad +0.029 \times \chi^{\mathcal{MED}} i_{t,j}^{m,z} & \text{for } f = m,\ j < R \\ 0 & \text{for } f = s, m,\ j \geq R \end{cases}$$

where $\chi^{\mathcal{O}}$ and $\chi^{\mathcal{MED}}$ are exogenous scale factors internally calibrated so that OASDI and Medicare tax receipts relative to are about 4.38% and 1.34% of aggregate output as estimated by the CBO for 2017.

For a household that dies at the end of any given period, there may be a federal tax imposed on the value of their estate. Federal estate tax liabilities, $\mathcal{T}_t^e(y_{j+1})$, are a piecewise linear function of a household's taxable estate, less applicable deductions and exemptions, which are modeled explicitly according to 2017 tax law. We define a household's taxable estate as $\chi^e y_{j+1}$, where χ^e is an exogenous scale factor internally calibrated so that the aggregate estate taxes are 0.12% of aggregate output as estimated by the CBO for 2017.

3.2.2. Firm taxation and the financial intermediary

We specify that tax liabilities for both corporate and noncorporate firms, txl_t^q, take the following form:

$$txl_t^q = \tau_t^q \left(Y_t^q - ded_t^q\right) - crd_t^q + slt_t^c \left(\boldsymbol{I}_{q=c}\right) \quad \text{for } q = c, n$$

where τ_t^q is an aggregate federal marginal tax rate (MTR) on net business income, ded_t^q are federal deductions from gross income, crd_t^q is a credit against gross federal tax liability, and $slt_t^c\left(\boldsymbol{I}_{q=c}\right)$ are state-local tax liabilities that are positve only for the corporate firm and detailed in Appendix B.2.3.

The aggregate federal MTR on corporate income is exogenously set to $\tau_t^c = 0.277$, which is the return-weighted[36] rate computed using the JCT Corporate Model[37] for calendar year 2017. The aggregate MTR on noncorporate income is exogenously set to $\tau_t^{nc} = 0.333$, which is the income-weighted value computed using the JCT-ITM for calendar year 2017.

Allowable federal deductions for firms include wage expense, interest expense, tax depreciation of capital, and state-local tax liabilities (for corporate sector only). Therefore:

$$ded_t^q = w_t N_t^q - i_t B_t^q - \left(\varrho^q I_t^q + \hat{\delta}^q da_t^q\right) - slt_t^c \left(\boldsymbol{I}_{q=c}\right) \quad \text{for } q = c, n$$

where ϱ^q is the capital investment expense ratio, $\hat{\delta}^q$ is tax depreciation rate of capital, $da_t^q \equiv (1 - \hat{\delta}^q) da_{t-1}^q + (1 - \varrho^q) I_t^q$ is current depreciation allowances. We exogenously set $\varrho^q = 0$ for simplicity and calibrate $\hat{\delta}^c = \hat{\delta}^n = 0.0056$ internally so that our initial steady state baseline reproduces a ratio of depreciation allowances to aggregate output consistent with that computed using the JCT Depreciation Model[38] for calendar year 2017.

We internally calibrate the lump-sum credits crd_t^q against federal tax liability in a time-invariant fashion so that steady state corporate and noncorporate tax liabilities relative to output each match an empirical counterpart for 2017. We target corporate tax liabilities to be 1.68% of aggregate output as estimated by the Congressional Budget Office (CBO) in the *The Budget and Economic Outlook: 2017 to 2027*, and noncorporate tax liabilities to be 1.36% of aggregate output as estimated using the JCT-ITM. Unlike corporate income, which is taxed at the firm level, noncorporate income is taxed at the household level jointly with other household income. The noncorporate income tax liabilities described here therefore do not affect the firm's cash flow Eq. (2.18).

[34] As described in Appendix B.2.1, capital income can be decomposed into ordinary capital income (noncorporate business income, interest income, short-term capital gains, and nonqualified dividends) and preferential capital income (long-term capital gains and qualified dividends). Tax liabilities computed on ordinary and preferential capital income respectively can then be allocated in proportion each income type for purposes of decomposition.

[35] The Additional Medicare Tax of 0.9% on earnings above \$200,000 and \$250,000 for individual- and joint-filers are modeled as part of federal income taxes $fit_{t,j}^{f,z}$.

[36] We choose return weights over income weights for this computation so that we can include C-corporations with zero taxable income.

[37] See Joint Committee on Taxation (2011) for a description of the JCT Corporate Model.

[38] See Joint Committee on Taxation (2011) for a description of the JCT Depreciation Model.

However, because the noncorporate firm's behavior must be consistent with the implied aggregate tax liabilities on its distributions to households, these liabilities are incorporated into the firm's value as in Eq. (2.16). Double-counting is avoided by including only the tax liabilities remitted at the household level in the government's budget constraint.

We assume that the aggregate EMTR on dividend and interest income, as well as the accrual-equivalent aggregate tax rate on gains, reflect only federal tax policy for simplicity. We exogenously set $\tau_t^d = 0.203$, and $\tau_t^i = 0.279$ in a time-invariant fashion, which are the income-weighted values computed by the JCT-ITM for calendar year 2017. We internally calibrate $\tau_t^g = 0.0521$ so that aggregate capital gains tax revenue is 0.67% of aggregate output.

4. Policy scenarios

As a benchmark scenario, in Section 4.2 we simulate the unexpected enactment of a federal tax of 1% on household wealth in excess of our model's top 1% threshold. The net change in federal tax revenue, inclusive of changes due to the underlying income tax system, is assumed to be used for federal debt reduction. We choose this as our benchmark scenario because a broad tax base is a natural point of departure for analyzing alternative scenarios that narrow the tax base, and because federal debt reduction is a budgetary offset that does not have first-order effects on households' budget constraints or firms' productivity.

In the first set of alternative scenarios, analyzed in Section 4.3, we simulate the provision of exclusions for owner-occupied housing and noncorporate equity respectively, holding constant the federal debt-reduction assumption. While both exclusions generate observable avoidance behavior, we find that the noncorporate equity exclusion generates a shift in productive activity from the corporate to the noncorporate sector that undermines the revenue-raising potential of the wealth tax. Moreover, we emphasize that this avoidance behavior is distinct from evasion behavior due to under-reporting.

In the second set of alternative scenarios, analyzed in Section 4.4, we simulate different uses for net revenue raised by the wealth tax, holding the broad tax base constant: an expansion of the standard deduction within the federal income tax system; a reduction of federal statutory ordinary income tax rates; the creation of an annual UBI transfer program; and investment in public infrastructure. We find that the projected macroeconomic effects of a given wealth can range from contractionary to expansionary depending how the additional revenues are spent. Out of the alternative expenditure options analyzed here, we find that those expenditures that generate more budgetary feedback tend to have relatively more positive aggregate output effects.

Before proceeding to the simulations described above, we briefly describe properties of the initial steady state wealth distribution and specify how wealth taxes are computed for purposes of the simulations.

4.1. Initial baseline wealth distribution and wealth taxation

4.1.1. Properties of the steady state wealth distribution

In order for us to obtain reliable quantitative estimates of the macroeconomic and budgetary effects of a top-wealth tax for the United States, it is crucial that the endogenous wealth distribution in our model reflects key empirical properties. The top panel of Table 6 shows that the share of wealth held by the top 10%, 1%, and 0.1% tax units in our model's initial steady state baseline closely aligns with the range of estimates from Smith et al. (2023) and Saez and Zucman (2020b).[39,40,41] Similarly, the bottom panel of Table 6 shows that the wealth thresholds for each top-wealth class within our model's baseline are broadly consistent with the data.

Table 7 shows the endogenous composition of household wealth for the top 10%, 1%, and 0.1% tax units in our initial steady state, as well as comparable empirical estimates from Smith et al. (2023). First, although the composition of financial wealth is homogeneous across households because the portfolio allocation is determined by the financial intermediary — described in Section 2.3 — the composition of total wealth is heterogeneous across households due to the owner-occupied housing choice — described in Section 2.1. Since financial assets represent a greater portion of total household wealth at higher points in the wealth distribution, the composition of total household wealth in our model varies over the distribution. Second, although not included in our set of calibration targets, our model endogenously produces owner-occupied and noncorporate equity shares that are reasonably close to the Smith et al. (2023) empirical estimates, albeit slightly higher. The average tax unit in the top 1% within the model, holds 24.0% and 18.5% of their wealth in noncorporate equity and housing, respectively, compared to the empirical estimates of 20.1% and 15.6%.

[39] Although households and tax units are equivalent within our model, we compare our model's estimates with those expressed in tax units. We do so because empirical estimates at the household level would incorporate cohabitation, for example, which we do not model.

[40] To be consistent with the data, our model computations exclude the implied portion of wealth that represents consumer durables.

[41] Tax-unit level estimates of Smith et al. (2023) obtained from private correspondence.

Table 6
Baseline top wealth shares and thresholds.

Total wealth shares			
Wealth group	**Data**, 2016 Smith et al. (2023)	**Data**, 2016 Saez and Zucman (2020b)	**Model**
Top 10%	68.4%	77.5%	66.7%
Top 1%	32.9%	38.8%	35.3%
Top 0.1%	15.9%	19.8%	19.7%

Wealth group thresholds (in thousands of 2018$)			
Wealth group	**Data**, 2016 Smith et al. (2023)	**Data**, 2016 Saez and Zucman (2020b)	**Model**
Top 10%	$1,057	$931	$1,065
Top 1%	$5,626	$5,034	$4,109
Top 0.1%	$26,988	$25,120	$31,084

• Figures inflation-adjusted from 2016 using a C-CPI-U factor of 1.038.
• All figures are at the tax-unit level.
• Tax-unit level estimates of Smith et al. (2023) obtained from private correspondence.
• The Saez and Zucman (2020b) estimates reflect an update to the Saez and Zucman (2016) estimates, and are maintained at https://gabriel-zucman.eu/uswealth/.

4.1.2. Introduction of a tax on household wealth

Household-level. We specify that direct federal wealth taxes apply to households' beginning-of-period stock of assets. With a single, time-invariant statutory tax rate of $\tau^{\boldsymbol{w}}$ on a broad base in excess of an exogenous threshold $\bar{y}$, a household's wealth tax liability is computed as follows:

$$\mathcal{T}_t^{\boldsymbol{w}}(h_j^o, a_j) = \max\left(\tau^{\boldsymbol{w}}(a_j + (1-\kappa^{dur})h_j^o - \bar{y}), 0\right) \tag{4.1}$$

where κ^{dur} is the assumed share of consumer durables contained in housing, and $\tau^{\boldsymbol{w}} = 0$ only in the initial steady state baseline. We set $\kappa^{dur} = 0.283$, which is the average share of consumer durables in the stock of residential capital over 2007–2016 as measured by the Bureau of Economic Analysis.[42] Housing and noncorporate equity exclusions are provided by subtracting $(1-\kappa^{dur})h_j^o$ and $\omega_t^{nw} a_j$ respectively from the wealth tax base, where ω_t^{nw} is the endogenous and time-varying portfolio share of financial assets held in the form of noncorporate equity.[43] With this structure, there is no "tax cliff" effect that occurs when a household crosses the $\bar{y}$ threshold.

To ensure comparability across simulations, we require each scenario to be "statically revenue-consistent". That is, the amount of tax revenue that would be gained from the broad-based scenario, the housing equity exclusion scenario, and the noncorporate equity exclusion scenario in a single steady state period — without any behavioral changes — are equivalent. This is achieved by choosing the wealth tax rate to be used in each respective scenario so that the following condition is satisfied:

$$\begin{aligned}
&\underbrace{\int_{\mathbb{Z}}\int_{\mathbb{J}} \sum_{f=s,m} \mathcal{T}_{SS}^{\boldsymbol{w}}(h_j^o, a_j)\Omega_{t,j}^{f,z}\, dj\, dz}_{\text{Steady State One-Period Wealth Tax Revenue}} \\
&= \underbrace{\int_{\mathbb{Z}}\int_{\mathbb{J}} \sum_{f=s,m} \left(\max\left(\tau^{\boldsymbol{w}}(a_j + (1-\kappa^{dur})h_j^o - \bar{y}), 0\right)\right)\Omega_{t,j}^{f,z}\, dj\, dz}_{\text{Broad-Based Scenario}} \\
&= \underbrace{\int_{\mathbb{Z}}\int_{\mathbb{J}} \sum_{f=s,m} \left(\max\left(\tau^{\boldsymbol{w}'}(a_j - \bar{y}), 0\right)\right)\Omega_{t,j}^{f,z}\, dj\, dz}_{\text{Housing Exclusion Scenario}} \\
&= \underbrace{\int_{\mathbb{Z}}\int_{\mathbb{J}} \sum_{f=s,m} \left(\max\left(\tau^{\boldsymbol{w}''}((1-\omega_t^{nw})a_j + (1-\kappa^{dur})h_j^o - \bar{y}), 0\right)\right)\Omega_{t,j}^{f,z}\, dj\, dz}_{\text{Noncorporate Equity Exclusion Scenario}}
\end{aligned} \tag{4.2}$$

where $\tau^{\boldsymbol{w}'}$ and $\tau^{\boldsymbol{w}''}$ are the wealth tax rates for the housing exclusion scenario and noncorporate equity exclusion scenario respectively.

[42] We exclude the consumer durable share of housing from the wealth tax to be consistent with our calibration of the wealth distribution as described Appendix B.1.2.

[43] The portfolio share of a noncorporate equity may be computed directly as $\omega_t^{nw} \equiv V_t^n / D_t$.

Table 7
Baseline wealth portfolio shares.

Wealth group	Noncorporate equity	Owner-occupied housing	Other
	Data, 2016 (Smith et al., 2023)		
Top 10%	14.8%	20.5%	64.6%
Top 1%	20.1%	15.6%	64.3%
Top 0.1%	23.7%	9.9%	66.4%
	Model		
Top 10%	22.6%	23.4%	54.0%
Top 1%	24.0%	18.5%	57.5%
Top 0.1%	26.2%	11.2%	62.6%

• All figures are at the tax-unit level.
• Tax-unit level estimates of Smith et al. (2023) obtained from private correspondence.

Aggregate-level. With the introduction of a household wealth tax, we must specify how the household-level EMTRs on wealth are related to the aggregate EMTRs on wealth that appear in the no-arbitrage condition (2.29), as the financial intermediary internalizes the average tax implications for households when allocating deposits into investment portfolios. Let $\tau_{t,j}^{\mathcal{A};f,z}$ be the time-varying EMTR on financial assets held in corporate equity ($\mathcal{A} = cw$), noncorporate equity, ($\mathcal{A} = nw$), bonds ($\mathcal{A} = bw$), or rental housing ($\mathcal{A} = rw$) for a household of (f, z, j) demographic.[44] In addition, let $\omega_t^{\mathcal{A}}$ be the time-varying endogenous portfolio share of financial assets held in $\mathcal{A} = cw, nw, bw, rw$.[45] The aggregate wealth EMTR applicable to a given financial asset type, $\tau_t^{\mathcal{A}}$, is then computed as an asset-weighted average over household-level EMTRs:

$$\tau_t^{\mathcal{A}} = \frac{\int_{\mathbb{Z}} \int_{\mathbb{J}} \sum_{f=s,m} \left(\tau_{t,j}^{\mathcal{A};f,z} \omega_t^{\mathcal{A}} a_j \right) \Omega_{t,j}^{f,z} \; dj \; dz}{\int_{\mathbb{Z}} \int_{\mathbb{J}} \sum_{f=s,m} \left(\omega_t^{\mathcal{A}} a_j \right) \Omega_{t,j}^{f,z} \; dj \; dz} \quad \text{for } \mathcal{A} = cw, nw, bw, rw \tag{4.3}$$

Aggregate wealth EMTRs are computed for each financial asset type in each period along the transition path. These aggregate wealth EMTRs generally differ from the statutory wealth tax rate because households with wealth below $\bar{y}$ have an ETMR of zero on their wealth and excluded financial assets have an EMTR of zero at the household- and aggregate-level.

While firms and the financial intermediary are not directly liable for the household wealth tax, it may nonetheless distort their decisions. Such a distortion arises when there is an exclusion provided for either corporate or noncorporate equity, as the differential tax treatment creates a tax wedge between the rates of return R_t^c and R_t^n. As a point of comparison, consider a broad-based wealth tax as we do in Section 4.2 where the aggregate wealth EMTRs on all investment vehicles would be equal, and no tax wedge exists. The financial market no-arbitrage condition (2.29) implies that for any period t, $R_t^c - \tau_t^{cw} = R_t^n - \tau_t^{nw}$. If $\tau_t^{cw} = \tau_t^{nw}$, then $R_t^c = R_t^n$, which is the same condition that would arise absent a wealth tax. Now consider an exclusion to the wealth tax for noncorporate equity, as we do in Section 4.3. With $\tau_t^{nw} = 0$, the financial market no-arbitrage condition then implies $R_t^c = R_t^n + \tau_t^{cw}$. By increasing the marginal investor's required rate of return in the corporate sector relative to the noncorporate sector, this distortion causes a reallocation of capital from the corporate to noncorporate sector that drives up the rate of return in the former and drives down the rate of return in the latter.

4.2. Benchmark policy: Broad-based wealth tax

A household's wealth tax liability under the broad-based ("benchmark") policy is determined by a single tax rate of $\tau^{\boldsymbol{w}} = 0.01$ applied to household wealth (excluding consumer durables) in excess of our model's initial steady state top 1% tax-unit threshold of $\bar{y} = \$4.109$ million (in 2018 dollars). All federal revenue raised, inclusive of net revenue changes from existing sources in the underlying federal tax system, is used to pay down federal debt for the first 40 years following implementation. After 40 years, we allow non-valued government consumption to change as needed to stabilize the path of debt so that the no-Ponzi condition (2.37) holds.[46] For this reason, we limit the reporting of our simulation results to the first 30 years following enactment. The macroeconomic and budgetary effects following enactment of this policy are described below, and expressed in terms relative to the initial steady state baseline path ("baseline").

Our benchmark wealth tax specification, while broadly similar to wealth tax schedules that have existed in European counties (OECD, 2018), is highly stylized and does not correspond directly to wealth tax schedules analyzed in the existing structural macroeconomic literature: Penn-Wharton Budget Model (2021), Penn-Wharton Budget Model (2020), and Diamond and Zodrow

[44] The EMTR on a given type of wealth for each household is computed by expressing the increase in their wealth tax liabilities that would occur due to a 1% increase in the quantity of that wealth type relative to 1%.
[45] Since each household has the same portfolio of financial assets chosen by the financial intermediary, endogenous portfolio shares $\omega_t^{\mathcal{A}}$ are uniform across households.
[46] See Moore and Pecoraro (2020a) for a discussion of fiscal closing assumptions.

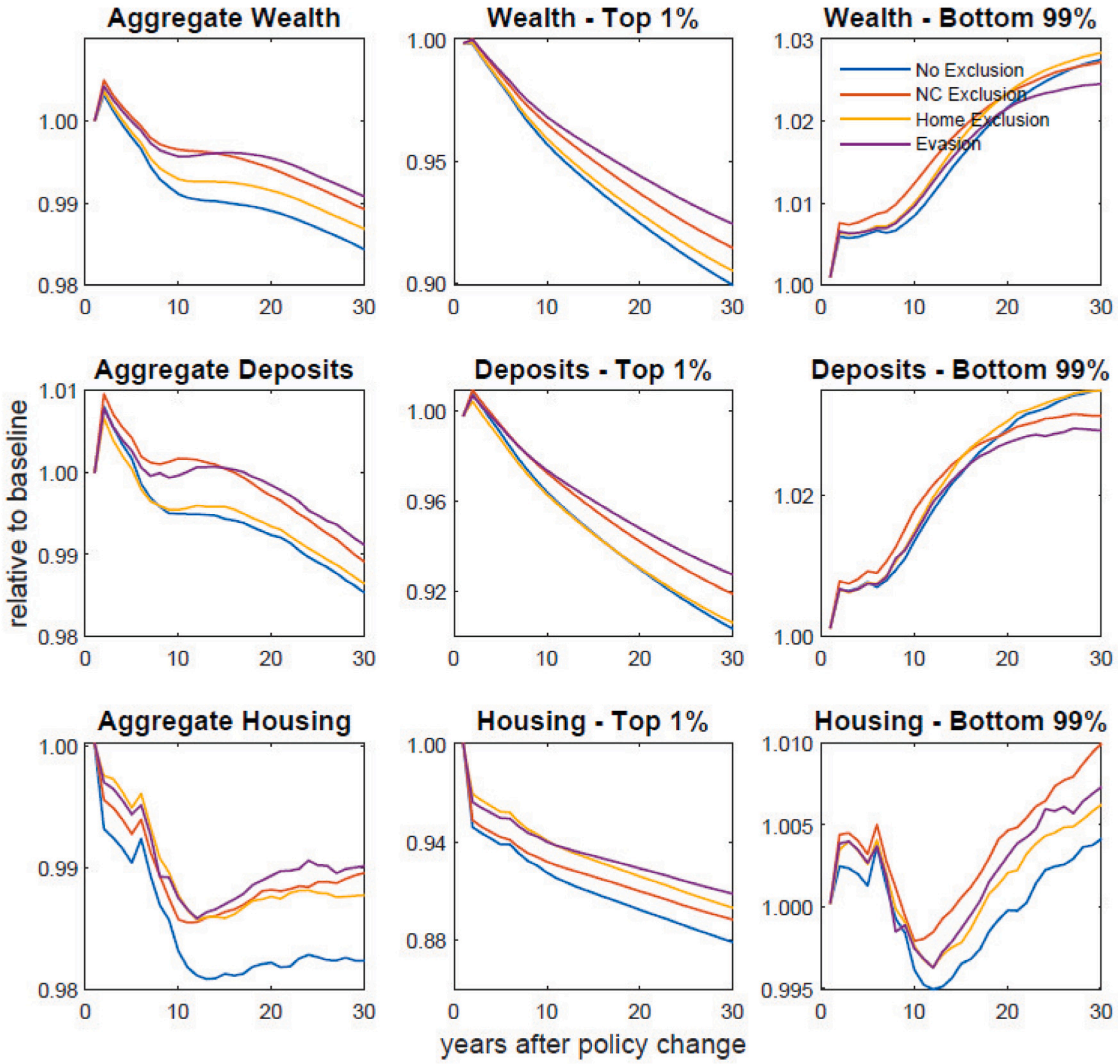

Fig. 1. Wealth Tax Base Alternatives: Household Wealth.

(2020) analyze the wealth tax proposals of former Democratic candidates for the US presidency; DeBacker et al. (2019) and Kaymak and Poschke (2019) analyze a progressive wealth tax in the spirit of Piketty (2014); Rotberg and Steinberg (2022) and Guvenen et al. (2023) analyze a proportional wealth tax on all households. Nonetheless, we attempt to generalize our findings sufficiently so that variations to the design of a wealth tax regime along the dimensions that we analyze in Sections 4.3 and 4.4 are broadly applicable.

Effect on household wealth. The responses of household wealth and its subcomponents to this benchmark policy are shown in Fig. 1, while the associated time paths of key prices are shown in Fig. 2. In the series labeled ‘No Exclusion’, aggregate wealth initially increases by about 0.3% before beginning a continuous decline to about 1.6% below its baseline level at the end of three decades. While both subcomponents of household wealth subject to the tax under this scenario — financial assets (deposits) and owner-occupied housing — are below their baseline levels by about the same magnitude after three decades, the respective time paths differ substantially. This difference occurs because of the variation in behavioral responses across high-wealth households who are affected both by first-order tax changes and second-order price changes, and other households who are only affected by the price changes in general equilibrium.

For the ‘Top-1%’ group of households,[47] the savings disincentive from the tax dominates the savings incentive from the increase in the portfolio rate of return, as their total wealth continuously declines despite a compositional shift towards financial assets.

[47] To be consistent across time, our ‘Top-1%’ group are those who, in the absence of the wealth tax, would have had total wealth in excess of the wealth tax threshold.

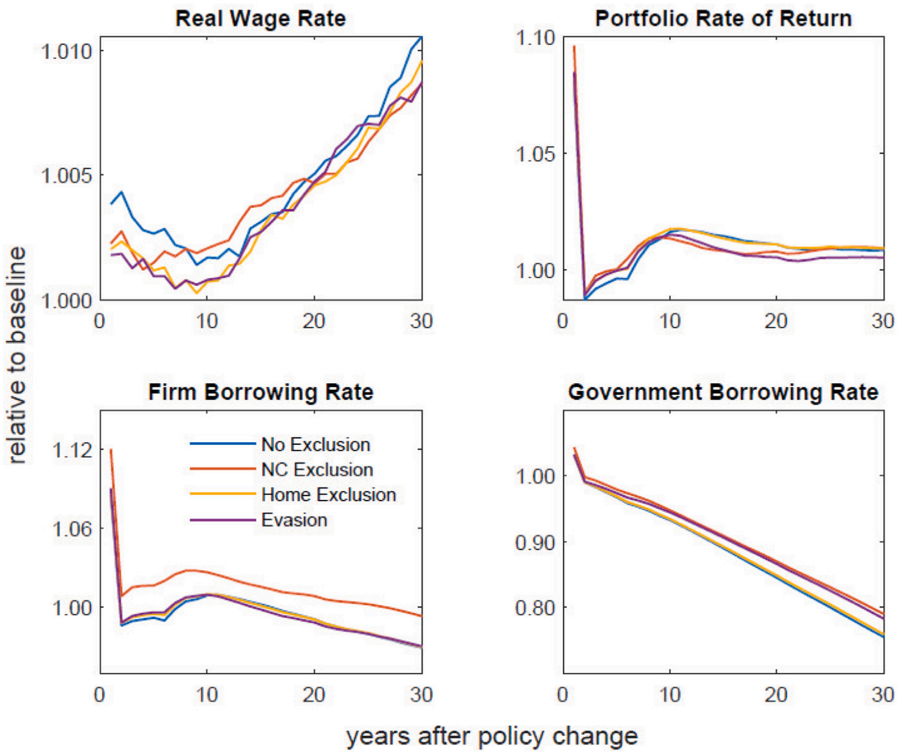

Fig. 2. Wealth Tax Base Alternatives: Prices.

The increase in the portfolio rate of return and compositional shift are especially pronounced in the first year of the policy change as capital gains on equity are realized by shareholders immediately. This occurs because, in our deterministic model, firm value increases contemporaneously with news that the future reduction in long-run government debt channels more investment towards private capital. The portfolio rate of return remains elevated over three decades because debt reduction also implies that the portfolio share of (high return) private assets relative to (low return) public bonds continues to increase. The 'Bottom-99%' group of households accumulate more financial assets because of this savings incentive, and accumulate more housing because the increase in the real wage rate raises their permanent income.[48] Because total wealth increases only for this group of households, it is their behavior that drives the initial increase in aggregate wealth.

Effect on productive activity. The relative after-tax rates of return to the subcomponents of financial assets (e.g. corporate and noncorporate equity and bonds) are not directly affected by the presence of a wealth tax under the benchmark policy because the broad base implies that the aggregate EMTRs on wealth $\tau^{cw}_{t+1}, \tau^{nw}_{t+1}, \tau^{bw}_{t+1}$, and τ^{rw}_{t+1} are all equal and positive. As described in Section 4.1.2, no new distortions introduced to the financial intermediary's portfolio allocation decision, and the time paths of the private factors of production shown in Fig. 3 are roughly symmetric across sectors for the 'No Exclusion' case.

The reduction in aggregate household financial assets drives up the firms' borrowing rate over the first decade. Consequently the capital stock falls below baseline levels in both sectors and reaches a trough of −0.3% in the aggregate after twelve years. This trend is reversed in the second decade as the positive effect of federal debt reduction on available resources dominates, bringing down the borrowing rate. Firms therefore increasingly substitute capital for labor in production, leaving aggregate private capital 1.3% above baseline and aggregate labor 1.2% below baseline at the end of three decades. Because the negative effect of labor on output dominates the positive effect of capital, aggregate output remains −0.2% below baseline after three decades.

Effect on tax revenue. Fig. 4 shows the path of projected revenue changes under the benchmark 'No Exclusion' policy, with select cross-sections highlighted in Table 8. Annual wealth tax revenue is equal to about $285 billion in the first year and $423 billion in the thirtieth year, both in 2018 dollars. Despite the large and growing amount of revenue raised from this new source, decreases in revenue from other sources are offsetting. Fig. 5 shows that while annual total federal tax revenue increases by about 7.7% over its baseline value in the first year of the policy, this gain falls to about 6.5% after three decades as a result of base erosion on all other revenue sources. Put differently, because the 30-year average annual amount of wealth tax and total tax revenue under the benchmark policy are about $347 billion and $284 billion respectively, such base erosion reduces the 30-year average annual net

[48] Note that the nested structure of the composite consumption good x_j implies that housing services are a normal good along with non-housing goods.

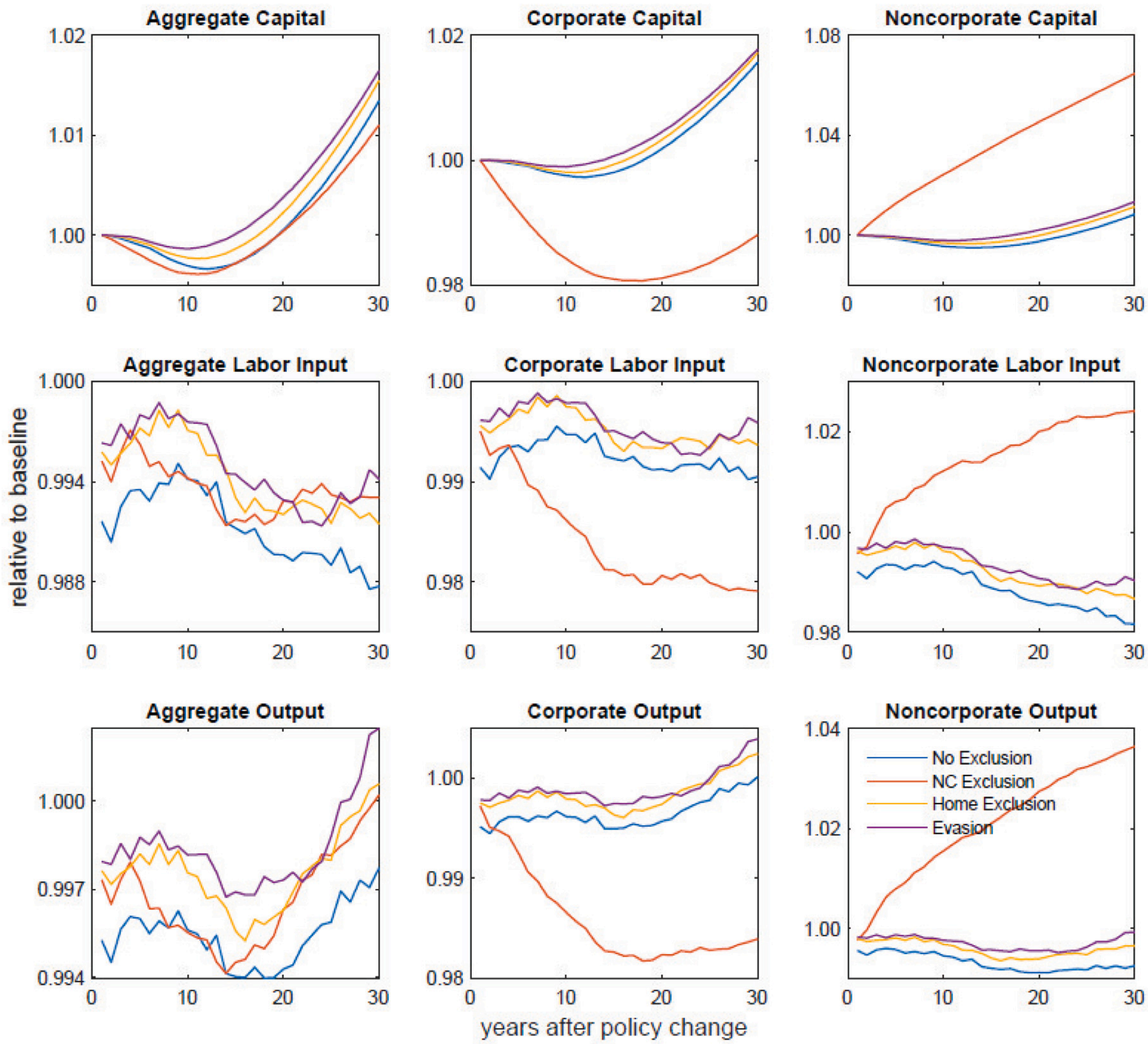

Fig. 3. Wealth Tax Base Alternatives: Productive Activity by Sector.

revenue increase by about 22.2%. Thus, accounting for budgetary feedback with respect to the underlying federal income tax system is crucial when estimating net revenue changes due to a wealth tax.

4.3. Alternative tax bases

4.3.1. Exclusions

We now simulate two alternative policies, where exclusions are provided for owner-occupied housing and privately-held noncorporate equity each in turn. Holding constant the top-1% threshold of $\bar{y} = \$4.109$ million, we internally calibrate the wealth tax rate in these two alternative scenarios so that the static revenue-consistency condition (4.2) is satisfied. This is achieved at $\tau^{w} = 0.0108$ and $\tau^{w} = 0.0133$ for the housing exclusion and the noncorporate equity exclusion policies respectively. As in the benchmark policy, all revenue raised from a given policy change is used to pay down outstanding federal government debt for the first 40 years following implementation.

Effect on household wealth. Overall, the reduction in the time path of aggregate total household wealth is attenuated under each alternative policy scenario. Relative to the benchmark policy, aggregate total wealth is about 0.2% larger on average over three decades when housing is excluded from the wealth tax base, and about 0.5% larger on average when noncorporate equity is instead excluded. This occurs because each exclusion policy generates household-level avoidance behavior where those households subject to the wealth tax hold relatively more wealth in the tax-preferred asset class, which happens endogenously in our model. Relative to

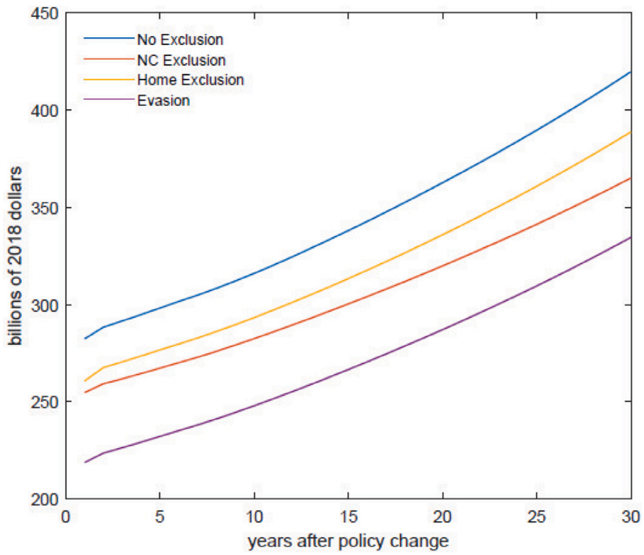

Fig. 4. Wealth Tax Base Alternatives: Wealth Tax Revenue.

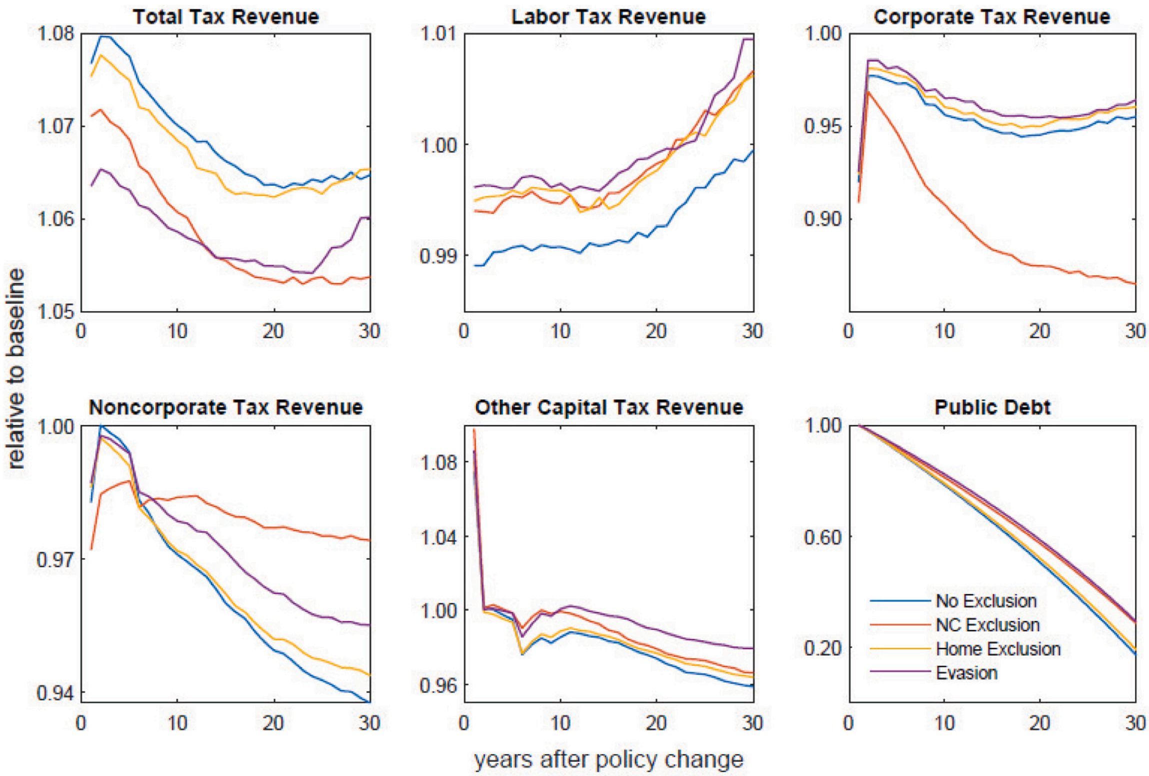

Fig. 5. Wealth Tax Base Alternatives: Federal Income Tax Revenue Sources and Debt.
Note: 'Labor Tax Revenue' includes revenue from payroll taxes in addition to income taxes on wages and Social Security benefits. 'Other Capital Income Tax Revenue' includes revenue from the taxation of dividends, interest, capital gains, and estates.

the benchmark policy, Fig. 1 shows that the ‘Top 1%’ wealthiest households[49] hold about 2.1% more housing on average over three decades when housing is excluded from the wealth tax base, and about 1.0% more financial assets on average when noncorporate equity is instead excluded. Because the relative price of housing is assumed to be perfectly inelastic for simplicity, the portfolio reallocation under the housing exclusion scenario should be interpreted as an upper bound.

Effect on productive activity. While the time paths of the private factors of production are relatively symmetric across sectors when housing is excluded from the wealth tax base, they differ significantly when noncorporate equity is excluded, as shown in Fig. 3. This results from the distortion introduced by the noncorporate equity exclusion as described in Section 4.1.2, with $\tau^{nw}_{t+1} = 0$ while $\tau^{cw}_{t+1} = \tau^{bw}_{t+1} = \tau^{rw}_{t+1} > 0$. With relatively cheaper financing costs for noncorporate firms under the noncorporate equity exclusion scenario, the noncorporate sector expands while the corporate sector contracts, consistent with the findings of Alvaredo and Saez (2010). In our simulation, this shift in productive activity amounts to a 3.6% increase in the noncorporate sector’s share of total output (from 31.06% to 32.18%) after three decades.

The shift in productive activity that occurs when noncorporate equity is excluded from the wealth tax base acts as a drag on total tax revenue (discussed below). This results in a relatively higher time path of public debt that puts upward pressure on the firm borrowing rate, delaying and weakening the crowding-in effect on private capital. Relative to the benchmark policy, aggregate private capital is about 0.4% lower while aggregate labor is about 0.3% higher on average over three decades.[50] Because labor has a larger production elasticity, aggregate output increases relative to the benchmark scenario by about 0.1% on average.

Absent cross-sector distortions that ultimately reduce tax revenue, increase public debt, and discourage investment, the relatively higher time path of aggregate financial assets under the housing exclusion policy imply relatively more resources available for private investment. Relative to the benchmark policy, aggregate capital and labor are both elevated by about 0.2% and 0.3% on average over three decades, causing a positive effect on aggregate output, which is about 0.2% higher on average.

Effect on tax revenue. [51] Table 8 shows that average annual revenue raised from the wealth tax over three decades is $25 billion smaller than the benchmark scenario when housing is excluded from the wealth tax base, but $39 billion smaller per year when noncorporate equity is excluded. When considering changes to all sources of federal tax revenue, the difference under the housing exclusion policy shrinks to $6 billion per year while the difference under the noncorporate equity exclusion policy grows to $42 billion per year. Because each of these policies are revenue-consistent in a static fashion, these differences are entirely due to behavioral and macroeconomic effects that occur in general equilibrium.

Figs. 4 and 5 show the time paths of tax revenue from each source. Because the housing exclusion policy raises more revenue from every other source relative to the benchmark policy, the smaller amount collected directly from the wealth tax is responsible for the smaller amount of total tax revenue collected. This contrasts with the noncorporate exclusion policy, where other sources of revenue instead contribute to the total tax revenue shortfall. In this scenario, the avoidance-driven shift in productive activity from the corporate sector to the noncorporate sector substantially reduces corporate income tax revenue while only moderately increasing noncorporate income tax revenue. Furthermore, this insufficient offset is growing over time: While the noncorporate exclusion policy raises about 8.0% less total revenue than the benchmark policy in the first year, it raises about 20.8% less in the thirtieth year.

4.3.2. Avoidance vs. Evasion

Recent empirical studies emphasize that, in addition to legal avoidance, illegal evasion via the under-reporting of assets and/or over-reporting of liabilities is an important component of the overall household behavioral response to wealth taxation (Seim, 2017, Durán-Cabré et al., 2019, and Brülhart et al., 2022). Diamond and Zodrow (2020), Penn-Wharton Budget Model (2020, 2021) incorporate evasion into their macroeconomic analyses of wealth tax proposals using a simplified reduced-form approach, whereby households under-report taxable wealth according to an exogenous semi-elasticity.[52] To draw contrast with the avoidance behavior highlighted in this paper, we simulate our broad-based policy while allowing for evasion using the same reduced-form approach. This involves the respecification of Eq. (4.1) to:

$$\mathcal{T}^{\boldsymbol{w}}_t(h^o_j, a_j) = (1 + \varepsilon\tau^{\boldsymbol{w}})\left(\max\left(\tau^{\boldsymbol{w}}(a_j + (1-\kappa^{dur})h^o_j - \bar{y}), 0\right)\right)$$

where ε is the semi-elasticity of reported wealth with respect to the tax rate. We choose a value of $\varepsilon = -19$ for our simulations so that the 30-year average annual total tax revenue increase in this scenario is approximately the same as that from the noncorporate equity exclusion policy, i.e. a 14.8% revenue shortfall compared to the benchmark policy (See Table 8).[53] With comparable revenue losses due to evasion and avoidance due to the noncorporate equity exclusion, differences in macroeconomic aggregates can be more easily attributed to the different underlying behavioral responses.

[49] Our ‘Top 1%’ group remains constant across policies for consistency.

[50] This is broadly consistent with Bjørneby et al. (2023), who find a positive causal relationship from a taxpayer’s wealth tax liability and employment growth in their closely-held firm using Norwegian data.

[51] All dollar figures are in 2018 dollars.

[52] Rotberg and Steinberg (2022) allow for endogenous evasion responses that vary across households.

[53] Local perturbations to $\varepsilon = -19$ do not substantially change our results.

Table 8
Annual revenue increase (in billions of 2018$).

Annual Wealth Tax Revenue Increase	Year 1	Year 15	Year 30	30-Year Average
No Exclusion (Benchmark) Policy	285	341	423	347
Housing Exclusion Policy	263	316	392	322
Noncorporate Equity Exclusion Policy	257	303	368	308
Broad-based Policy with Evasion	220	269	337	274
Annual Total Tax Revenue Increase	Year 1	Year 15	Year 30	30-Year Average
No Exclusion (Benchmark) Policy	243	271	349	284
Housing Exclusion Policy	239	259	352	278
Noncorporate Equity Exclusion Policy	225	227	289	242
Broad-based Policy with Evasion	201	229	324	242

Fig. 1 shows that the reduction in the time paths for household wealth are relatively attenuated for both asset classes when wealth is systematically under-reported.[54] Under the assumption that unreported assets remain within the domestic financial system,[55] there are relatively more resources available for private investment by firms than in any other scenario analyzed here. Relative to the benchmark scenario, aggregate capital and labor are therefore about 0.2% and 0.4% higher on average over three decades as shown in Fig. 3. In the absence of cross-sector distortions, the response of economic activity is symmetric in both the corporate and noncorporate sectors with output above its benchmark level by 0.3% on average. Notably, this is the only alternative tax base scenario where output exceeds its pre-policy level within three decades.

Figs. 4 and 5 show the time paths of wealth tax revenue and federal tax revenue from other sources. When evasion occurs at our specified intensity under a broad-based wealth tax, revenue raised directly from the wealth tax is relatively lower than the benchmark policy by $65 billion and $86 billion in the first and thirtieth years following implementation (in 2018 dollars), differentials larger than any other tax base alternative analyzed here. Because the three-decade total average annual tax revenue increase matches the same 14.8% benchmark policy shortfall as the noncorporate exclusion policy by design, we can observe a distinct difference in the pattern of the shortfall across policies: While the noncorporate exclusion policy has a growing relative shortfall over three decades, the broad-based policy with evasion has a shrinking relative shortfall, from 20.1% in the first year to 7.7% in the thirtieth year. Thus, while the revenue losses from avoidance in the noncorporate equity exclusion policy are growing over time, the losses from evasion are shrinking over time. It is worth noting that one form of behavior that may cause increased avoidance over time under any scenario considered here is not modeled: investments cannot be shifted internationally in response to a wealth tax. Differentials between policy variations in our simulations are entirely due to the shifting of domestic investments and base erosion.

4.4. *Alternative budgetary assumptions: Expenditures*

For our benchmark simulation, it is assumed that additional federal tax revenue under the wealth tax is used to reduce outstanding public debt. To show how the projected macroeconomic and budgetary effects of a wealth tax depend on how the additional revenues are used, we consider the following alternatives to federal debt reduction: (i) a permanent expansion of the federal standard deduction,[56] (ii) a reduction in federal statutory ordinary income tax rates,[57] (iii) increased investment in public infrastructure, and (iv) the creation of an annual UBI transfer.

That is, rather than allowing $B^{g,tot}_{t+1}$ to take on the residual value of the federal government's recursive budget constraint each period along the transition path, we instead allow the residual value to determine $\mathcal{T}^i_t(i^{f,z}_{t,j}, r^p_t a_j)$, I^{fed}_t, or trs_t. Below we describe the macroeconomic and budgetary effects over the first three decades following enactment of the broad-based wealth tax with each alternative expenditure policy, expressed in terms relative to the benchmark debt-reduction scenario.

[54] While Brülhart et al. (2022) points out that financial assets are under-reported at a greater frequency than housing assets, we assume uniform evasion rates to maintain simplicity and consistency with previous analyses.

[55] This assumption is maintained in Penn-Wharton Budget Model (2021, 2020), Diamond and Zodrow (2020), and Rotberg and Steinberg (2022).

[56] The standard deduction is a specific dollar amount that reduces the amount of income on which a household is taxed. An expansion of the standard deduction is therefore a type of overall income tax cut. Since our model is calibrated to the 2017 economic and tax-law environment, our baseline standard deduction is equal to $6457 and $12,915 for single and married households (expressed in 2018 dollars).

[57] In our 2017 economic and tax-law baseline, the federal statutory tax rate schedule for ordinary income includes rate brackets: 10%, 15%, 25%, 28%, 33%, 35%, and 39.6%. The marginal tax rates depend on a tax unit's taxable income, where the bracket thresholds for a married couple filing jointly are generally twice those for a single filer. Ordinary income includes wage and self-employment income, noncorporate business income, interest income, short-term capital gains, and nonqualified dividends.

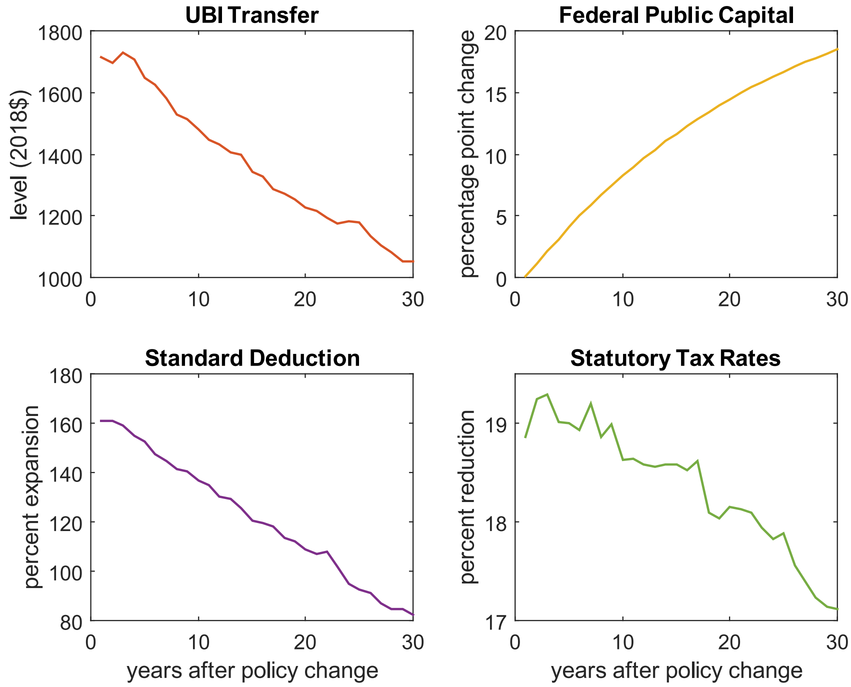

Fig. 6. Expenditure Alternatives.

Effect on productive activity. Fig. 6 shows that when additional revenues are used to expand the standard deduction, an increase of 161.0% and 82.3% in the deduction amount relative to baseline are availed in the first and thirtieth years. Although the expanded deduction is inframarginal for high-income households who remain within the top statutory income tax bracket despite lower taxable income, it is an incentive to increase labor supply for other households who may be pulled into a lower statutory tax bracket because of their lower taxable income. The resulting lower real wage rate shown in Fig. 7 causes firms to substitute labor for capital in production. Fig. 8 shows that while labor supply is about 0.7% higher on average relative the debt-reduction scenario, the capital stock is about 0.9% smaller on average. Because the latter increasingly diminishes the positive output effect over time by reducing aggregate labor productivity, aggregate output declines from its high point of 0.5% above the debt-reduction scenario in year two to 0.9% below it in year thirty.

Using the wealth tax revenue to proportionally decrease statutory tax rates on ordinary income allows for a 18.9% and 17.1% reduction in the first and thirtieth years. Unlike the standard deduction expansion, the rate reduction encourages labor supply for all households that have positive taxable income. The path of aggregate labor supply is thus 2.8% higher than the debt-reduction scenario on average over three decades, and about 1.9% higher than the initial present-law baseline. Because higher labor supply increases the marginal product of capital, firms increase investment and expand production so that the paths of aggregate capital and output are about 0.6% and 1.8% higher than the debt-reduction scenario on average over thirty years.

When used for investment in public infrastructure, additional revenues under broad-based wealth tax allow for a net-of-depreciation increase in federal public capital relative to GDP of about 18.5 percentage points (from about 8.8% to 27.3%) after three decades.[58] This increase in public capital, which incorporates time-to-build effects and state-local offsets, increasingly raises the productivity of both private factors of production and increases firm demand for private capital and labor. Compared to the debt-reduction scenario on average over three decades, this allows for labor to be about 0.5% higher and private capital to be about the same despite the absence of crowding-in effects. Due to increasing public capital, aggregate output is about 1.7% higher than the debt-reduction scenario by the end of three decades.

When additional revenues are used to finance the creation of an annual UBI transfer, the broad-based wealth tax allows for transfers of $1716 per taxpayer in the first year, falling to $1053 per taxpayer in the thirtieth year.[59] Because these transfers have a positive income effect on all households, there is a reduction in labor supply of about 0.5% relative to the debt-reduction scenario on average over three decades. Since this reduces the marginal productivity of capital, firms also reduce capital by about 1.3% on average. This results in a relatively low path of aggregate output, which is about 1.4% below the debt-reduction scenario after three decades.

58 Local perturbations to public capital's share of output do not substantially change our results.

59 In computing this figure, we assume that the 144.3 million tax units who filed federal returns in 2018 grows at our assumed annual population growth factor of $\Upsilon_P = 1.0076$.

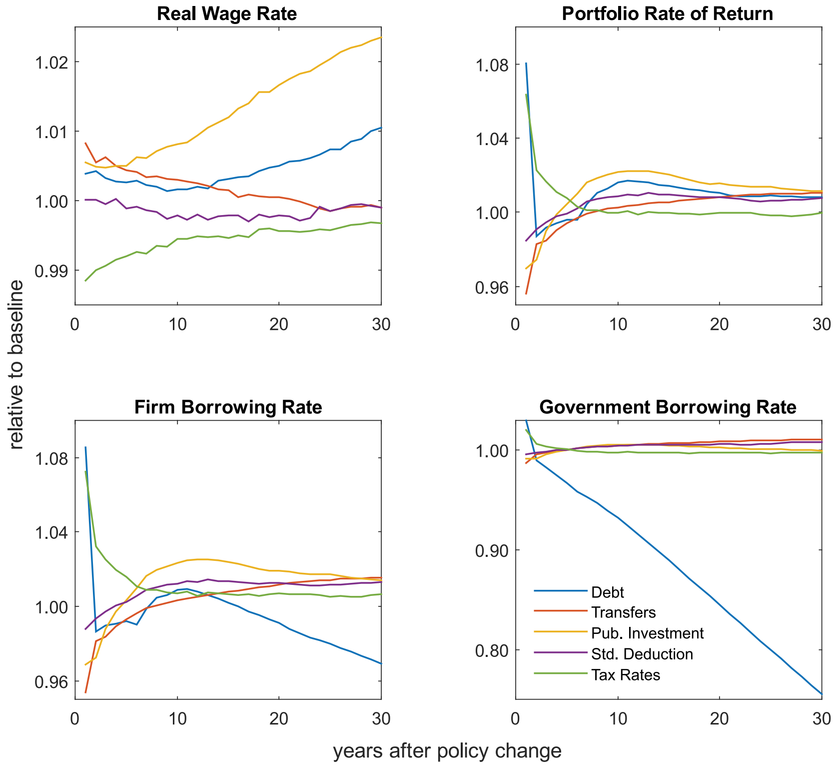

Fig. 7. Expenditure Alternatives: Prices.

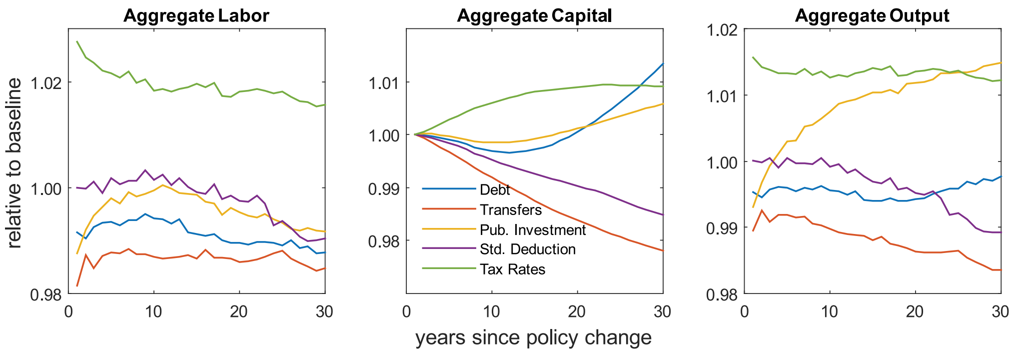

Fig. 8. Expenditure Alternatives: Aggregates.

Effect on household wealth. Fig. 9 shows that when additional revenues are used to expand the standard deduction instead of to reduce outstanding federal debt, the time path of aggregate housing is elevated by about 1.1% while the time path of aggregate financial assets are depressed by about 0.4%, both relative to the debt-reduction scenario on average over three decades. The expanded standard deduction creates a first-order incentive for low- and middle-income taxpayers in the 'Bottom 99%' group to increase labor supply and subsequently housing because of the consumption services it provides. The higher after-tax income also allows for households within this group to accumulate relatively more financial assets by the end of three decades. The relative reduction in the path of aggregate financial assets is therefore driven by households in the 'Top 1%' group, who save less than under the benchmark scenario because portfolio returns are not as favorable when federal debt remains constant.

Using the revenues to reduce ordinary income tax rates not only results in time paths for aggregate deposits and housing that are relatively higher by about 1.8% and 2.6% on average over three decades, but also results in the only scenario that exhibits higher time paths for both aggregates relative to the initial present-law baseline. This occurs primarily because the savings incentive created by the rate reduction affects all households with positive taxable income, and somewhat offsets the savings disincentive created by the wealth tax itself for households within the 'Top 1%' group. While households within the 'Bottom 99%' group accumulate more financial and housing wealth relative to the initial present-law baseline, the reduction in the portfolio rate of return causes them

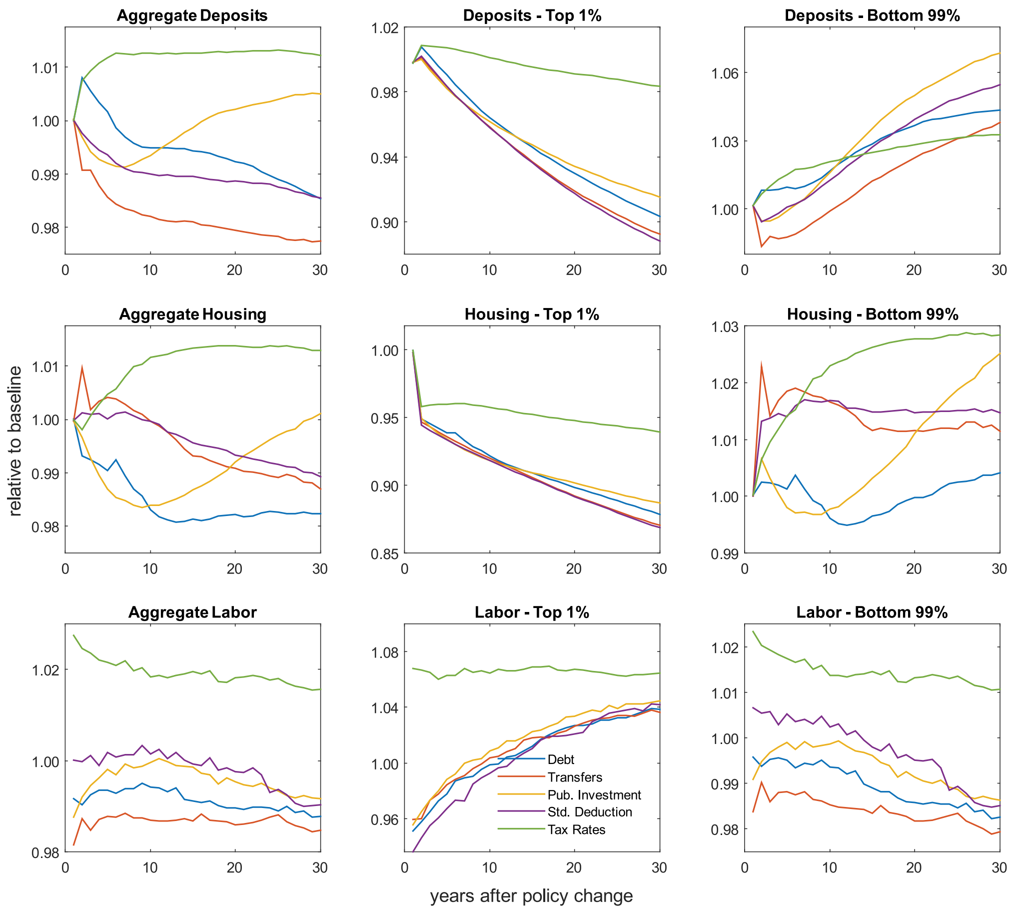

Fig. 9. Expenditure Alternatives: Household Wealth and Labor Supply.

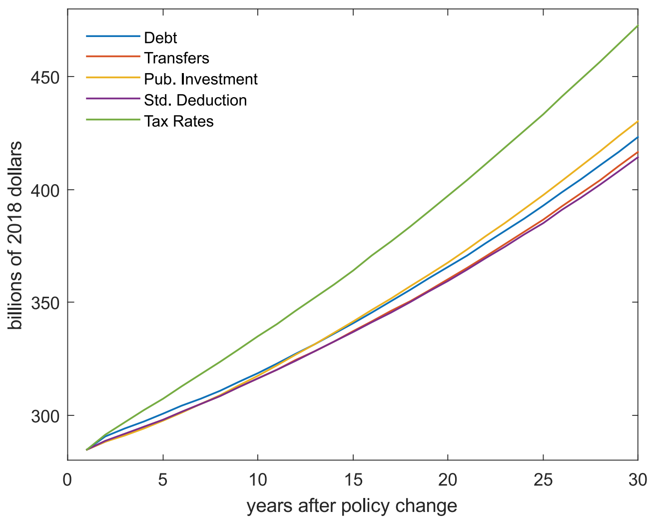

Fig. 10. Expenditure Alternatives: Wealth Tax Revenue.

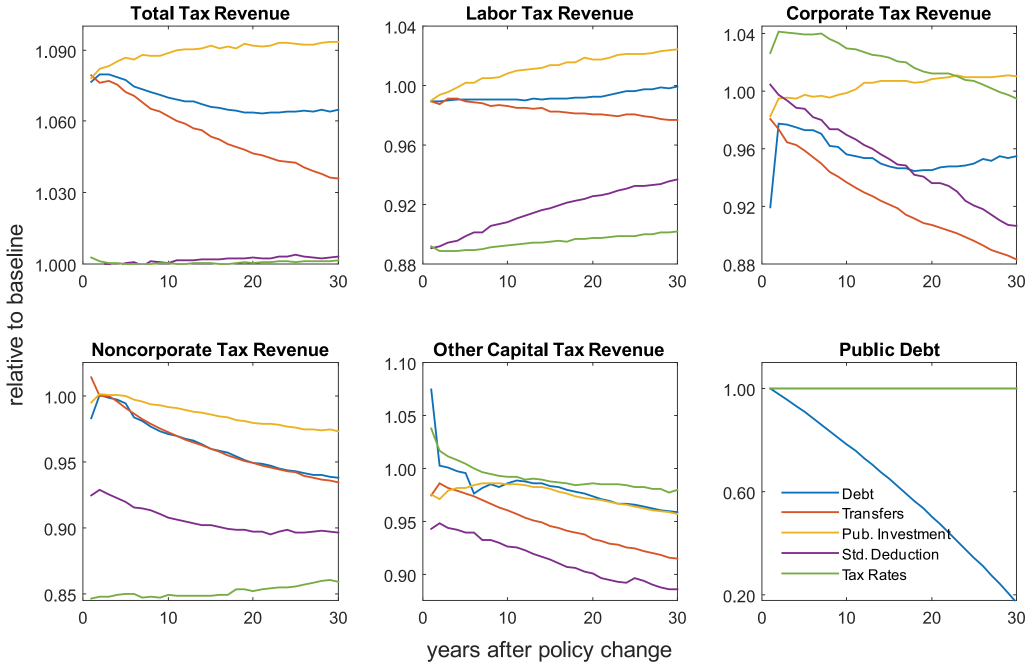

Fig. 11. Expenditure Alternatives: Federal Income Tax Revenue Sources and Debt.
Note: (i) 'Labor Tax Revenue' includes revenue from payroll taxes in addition to income taxes on wages and Social Security benefits. 'Other Capital Income Tax Revenue' includes revenue from the taxation of dividends, interest, capital gains, and estates.

to hold about 0.3% less financial wealth in favor of about 2.3% more of housing wealth relative to the debt-reduction scenario on average over three decades.

When additional revenues are instead used to finance public infrastructure investment, both aggregate financial assets and housing exhibit a U-shaped time path that leaves each about 2.0% and 1.9% higher than they are under the debt-reduction scenario at the end of three decades. This occurs because the positive effect of public infrastructure on factor returns builds over time. These second-order price changes generate an increase in the portfolio rate of return that encourages households in both the 'Top 1%' and 'Bottom 99%' groups to hold relatively more financial assets, as well as positive real wage growth that leads these households to hold relatively more housing for the consumption services it provides.

Finally, when additional revenues are used to create an annual UBI transfer, the time paths of aggregate financial assets and housing are about 1.2% below and 1.1% above their paths in debt-reduction scenario on average over three decades. This is primarily driven by the households in the 'Bottom 99%' group, for whom the transfers make up a relatively larger portion of income. These households experience a first-order income effect that causes them to reduce their holdings of financial assets and increase housing for consumption services. This result is similar to the standard deduction expansion scenario, with the primary difference stemming from the depressing effect that the reduced labor supply has on financial asset holdings of households in the 'Bottom 99%' group.

Effect on tax revenue. Changes to federal income and wealth tax revenues are shown in Figs. 10 and 11 for all alternative expenditure scenarios. Because the standard deduction expansion and statutory rate reduction operate through the tax code — as opposed to the public investment expansion and creation of UBI transfers which operate through spending — they have an approximate net zero effect on total tax revenue by design. Nonetheless, we can make these tax options comparable to the spending options by expressing the former as a tax expenditure per taxpayer and the latter as an outlay change per taxpayer. On this basis, the broad-based top-wealth tax affords the following average additional expenditures per taxpayer over three decades: $2910 for the statutory tax rate reduction, $2280 public infrastructure investment, $1553 standard deduction expansion, and $1370 for the UBI transfers.[60] which follows the same rank order as that for average aggregate output effects.[61]

Generally, the expenditures that have a relatively more positive (negative) effect on aggregate output also have a relatively more positive (negative) effect on the overall federal tax base. The debt-reduction scenario is an exception, however, generating additional outlays per taxpayer of $3360 on average over three decades but with approximately the same average three-decade effect

[60] In computing these figures, we assume that the 144.3 million tax units who filed federal returns in 2018 grows at our assumed annual population growth factor of $\Upsilon_P = 1.0076$.

[61] Our rank order of output effects is consistent with Diamond and Zodrow (2020), who also find that debt reduction dominates transfers in terms of output effects for a given wealth tax, as well as Rotberg and Steinberg (2022), who also find that income tax reduction dominates transfers in terms of output effects for a given wealth tax.

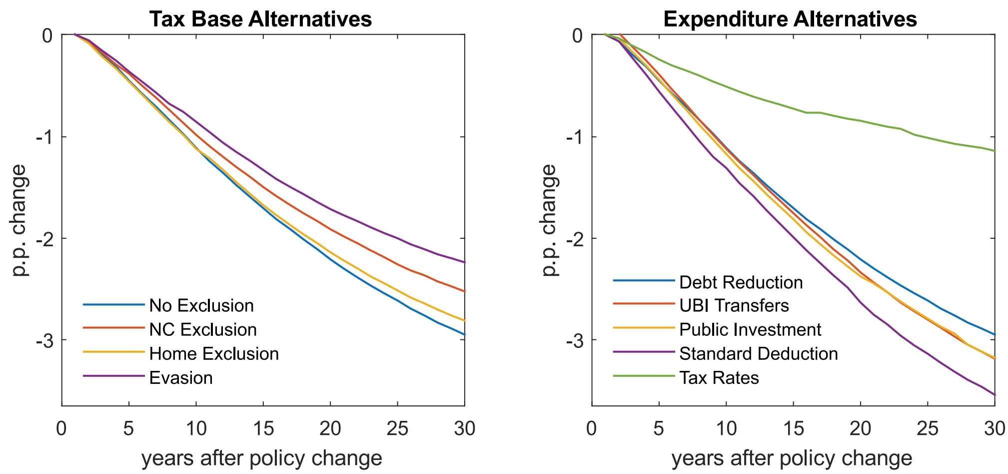

Fig. 12. Changes to Top 1% Wealth Concentration.

on aggregate output as the standard deduction expansion. Debt reduction is an outlier because budgetary feedback incorporates changes to both revenue and outlays due to macroeconomic activity, the latter including interest payments on Federal debt, which is reduced to 20% of the 2018 amount after 30 years.

4.5. Wealth taxes and wealth concentration

The left panel of Fig. 12 shows the dynamics of the top-1% wealth share over three decades under each of the tax base scenarios.[62] The largest reduction in wealth concentration occurs under the benchmark broad-based scenario, which reduces the top-1% wealth share by about 2.9 percentage points after thirty years from the 35.3% wealth share that percentile holds in the initial baseline. While providing the exclusion for owner-occupied housing does not significantly affect the reduction in wealth concentration, providing the exclusion for noncorporate equity results in a reduction in the top-1% wealth share that is 0.4 percentage points smaller than the reduction under the benchmark scenario. This result conforms with our earlier finding that the avoidance response in the noncorporate equity exclusion scenario is an important margin of adjustment: As taxpayers limit their wealth tax liabilities by shifting their wealth into noncorporate equity, they also limit the amount of wealth that can be redistributed.

The right panel of Fig. 12 shows the dynamics of the top-1% wealth share over three decades under each of the expenditure scenarios. The largest reduction in the top-1% wealth share — 3.5 percentage points after thirty years — occurs when wealth tax revenues are used to expand the standard deduction. This is consistent with the notion that an expansion of the standard deduction disproportionately lowers the income tax liabilities of households outside of the top-1%, allowing for them to accumulate more financial and housing wealth. This is in stark contrast to the statutory tax rate reduction scenario, which reduces the top-1% wealth share by only 1.1 percentage points after thirty years, as it disproportionately lowers the income tax liabilities of high-income households that overlap with the top-1% of the wealth distribution.

5. Conclusion

This paper uses an overlapping generations model with endogenous tax avoidance and rich tax detail to show how the macroeconomic and budgetary effects of a wealth tax regime for the United States depend both qualitatively and quantitatively on how the tax base is specified and how the additional revenues generated by the tax are used. In particular, our main findings are that the provision of exclusions from the tax base for privately-held noncorporate equity distorts investment choices and create avoidance opportunities that can undermine the revenue-raising potential of the tax, and that the range of possible uses for the additional revenue generated by the wealth tax implies a range macroeconomic outcomes from contractionary to expansionary.

Our findings provide policymakers with information pertinent to the design of a wealth tax regime for the United States. First, if an attempt is made to levy a wealth tax on a broad base, then the costs of enforcing the broad base should be weighed against the potential revenue to be gained by eliminating avoidance. Second, the optimal wealth tax regime will depend on the expenditures that are paired with the tax. Our findings suggest that a wealth tax regime should be viewed in a holistic fashion, with the design of the tax and the use of the revenues considered jointly.

[62] Because we compute the top-1% wealth share from a repeated cross-section, the same households are not necessarily in the top-1% group each year.

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Appendices

Supplementary material related to this article can be found online at https://doi.org/10.1016/j.jmacro.2023.103559.

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