Tax the Wealthy? A Dynamic General Equilibrium Analysis of Progressive Wealth Taxation

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Abstract

Rising wealth inequality has spurred calls to tax rich households' wealth, but critics argue that taxing the wealthy could have adverse macroeconomic consequences and that tax evasion could limit the public-finance benefits. We study the impact of progressive wealth taxation using an overlapping-generations model with heterogeneous entrepreneurial abilities that we calibrate to U.S. data. In the short run, welfare would rise and the tax would raise substantial revenues. In the long run, inequality would fall but revenues would shrink and the macroeconomy would contract. If tax evasion shifts capital offshore, the macroeconomic consequences would be larger and swifter, and workers' welfare would fall rather than rise as progressive wealth tax proponents claim.

JEL Classification: E21; E22; E62; H21; H26

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1 Introduction

Progressive policymakers like Senator Elizabeth Warren have proposed taxing wealthy households' assets to curb rising wealth inequality. Supporters of a progressive wealth tax argue that it would hinder the accumulation of large fortunes and would raise substantial revenues that could be redistributed to poorer households, but critics argue that such a policy could reduce investment and harm the macroeconomy, especially if wealthy households move their assets offshore in order to evade the tax. How would the wealth distribution evolve in response to a progressive wealth tax and how much revenue would it raise? How would the macroeconomy respond in equilibrium and what would be the welfare consequences? In this paper, we use a dynamic general equilibrium model to provide quantitative answers to these questions.

Figure 1 illustrates how concentrated the distribution of wealth in the United States has become in recent decades. Since the late 1980s, the share of wealth held by the top 0.1 percent of households in the

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Survey of Consumer Finances (SCF) has grown from 10 percent to 15 percent, while the bottom 90 percent of households' share has fallen from 33 percent to 23 percent. Researchers have argued that this trend could have a range of adverse socioeconomic effects and concerns have also grown among policymakers and the general public. In a widely-read book on the topic, Piketty (2014) advocates a tax on rich households' wealth as a remedy.

Recently, Senator Elizabeth Warren proposed a progressive wealth tax that has received extensive media coverage and the backing of U.C. Berkeley economists Emmanuel Saez and Gabriel Zucman. Senator Warren's proposal features a two percent tax on wealth above $50 million and a surtax of 1 percent on wealth above $1 billion. Saez and Zucman (2019b) estimate that given the current U.S. wealth distribution, this tax would apply to about 0.1 percent of households and would raise about one percent of GDP in revenue per year. If this policy is effective at reducing wealth concentration, however, it could generate less revenue over time as the wealth distribution evolves, and if the decline in rich households' financial wealth translates into a reduction in physical capital, output and wages could fall in equilibrium. Moreover, although Saez and Zucman (2019b) account for the possibility of tax evasion in their estimation of the policy's public-finance effects, evasion could also amplify the macroeconomic consequences if rich households shift their wealth offshore in order to evade the tax, which could take additional capital out of the economy. In this paper, we shed new light on the consequences of progressive wealth taxation by using a general equilibrium model to quantify the effects that Senator Warren's proposal would have on public finances, inequality, macroeconomic dynamics, and welfare, and how these effects depend on the nature of wealth tax evasion.

Our model features overlapping generations of finitely-lived households that are heterogeneous in labor market ability and entrepreneurial skill. During their working years, households choose an occupation—worker or entrepreneur—and how much of their income to save. Entrepreneurs borrow against their assets to finance their capital expenditures and higher-ability entrepreneurs earn greater returns on their wealth. This rate-of-return heterogeneity is the key to generating a realistic level of wealth concentration as shown by recent studies such as Quadrini (2000), Cagetti and De Nardi (2006), and Benhabib et al. (2011, 2015, 2016). Retired households receive social security transfers and continue to save in order to leave bequests for their offspring as in Cagetti and De Nardi (2006) and Piketty and Saez (2013). We calibrate our model so that its equilibrium under the current U.S. tax code—that is, its equilibrium without a wealth tax—matches the share of wealth held by the top 0.1 percent of households in the latest edition of the SCF and other recent U.S. data. Our calibrated model replicates the overall wealth distribution, not just the top 0.1 percent share, and fits the data on a number of other non-targeted statistics such as the entrepreneurship rate and the ratio of intergenerational bequests to total wealth.

Starting from this no-wealth-tax benchmark equilibrium, we introduce a progressive wealth tax which we parameterize to capture Senator Warren's proposal: wealth above the model equivalent of $50 million is taxed at a rate of two percent, and wealth above $1 billion is taxed at an additional one percent. The revenues generated by this tax are redistributed in a lump-sum fashion. The government cannot perfectly enforce the tax, however: households hide a portion of their taxable wealth that increases with the rate at which this wealth is taxed. We consider two specifications of our model with different consequences of evasion for the real economy. In the first, hidden wealth remains onshore and entrepreneurs can use it to finance their capital expenditures. In the second, by contrast, hidden wealth moves offshore and entrepreneurs can no longer borrow against it. In both specifications, we solve for the transition dynamics that follow the implementation of the tax, not just its long-run consequences, which allows us to accurately measure the tax's effects on macroeconomic dynamics and welfare.

In the short run, the tax would be paid by the top 0.1 percent of households and it would raise 0.63 percent of GDP in revenue, which would finance lump-sum transfers of about one percent of the average labor income. Over time, these households' share of wealth would fall by between one quarter and one third, reducing the concentration of wealth substantially, but tax revenues and transfers would fall by more than fifty percent. Other measures of wealth inequality like the Gini coefficient would change negligibly; this policy would only reduce inequality at the very top of the wealth distribution.

Output and wages would decline regardless of whether hidden wealth remains onshore, but the timing and severity of these effects hinge crucially on this distinction. In the first specification of our model there is no short-run macroeconomic effect, only a gradual contraction, and output and wages would fall by 0.63 percent and 0.43 percent, respectively, in the long run. In the second specification, however, output and wages would fall by almost half a percent as soon as the policy is implemented, and they would fall further in the long run as well. In both specifications, macroeconomic dynamics feature significant overshooting, highlighting the importance of explicitly modeling transitions rather than focusing on the policy's long-run consequences.

Aggregate welfare would rise and a majority of the population would support the tax even though output and wages would fall. In the short run, welfare would increase by 0.58–0.64 percent and 99.9 percent of households would approve of the policy in both tax evasion specifications; only the households that are subject to the tax would disapprove of it. These welfare gains would decline over the course of the transition as wages and transfers fall, but the tax would improve aggregate welfare even in the long run, although the extent of long-run popular support depends strongly on the nature of tax evasion. In the first specification, 99.9 percent of households would approve of the policy even in the long run, but in the second specification the long-run approval rate would be only 54.7 percent.

The welfare gains from the tax would not be evenly distributed, however. The primary beneficiaries would be younger, less wealthy entrepreneurs, whose income would rise because the policy would reduce competition from older, wealthier households; this finding lends support to Saez and Zucman (2019a)'s conjecture that a progressive wealth tax would increase entrepreneurship among the less wealthy. Young entrepreneurs' welfare gains would be particularly large if hidden wealth moves offshore, even though aggregate welfare gains would be smaller in this scenario. In contrast, workers would see small welfare gains, especially in the long run. In fact, most workers would actually lose in the long run in the second specification, because the decline in their wages would outweigh the transfers they would receive. We urge policy makers to take note of this result as it contradicts the conventional belief that a wealth tax would benefit poorer households.

Our results indicate that general equilibrium forces play crucial roles in transmitting the effects of a progressive wealth tax. Young entrepreneurs' welfare gains are driven by lower competition which raises the prices at which they sell their products, and workers' long-run losses in the second specification of our model are driven by falling wages. To illustrate the importance of these forces, we conduct two partial-equilibrium versions of our analysis. In the first, we fix the wage at its higher pre-wealth-tax level and the price of entrepreneurs' output to its higher post-wealth-tax level. Here, all households except those that are liable for the tax gain in both specifications, even in the long run. In the second partial-equilibrium analysis, we do the reverse, fixing the price of entrepreneurs' output at its lower initial level and the wage at its lower long-run level. In this version of the analysis, all households lose.

We also conduct a number of other sensitivity analyses in which we explore how our results depend on model assumptions and important aspects of our calibration. When we calibrate the dispersion of entrepreneurial abilities to generate a more concentrated wealth distribution, the tax raises more revenue and generates higher welfare gains, but also causes a larger macroeconomic contraction. When we allow the interest rate to adjust in equilibrium as well as the wage, the policy has similar effects on public finances as in our baseline analysis but has larger macroeconomic consequences. Finally, when we incorporate housing wealth as well as financial wealth and model households' decisions to rent or own houses, the policy's public-finance and macroeconomic effects are similar, but low-income workers' welfare gains are larger because the wealth tax revenue transfers help defray housing expenses, which are large relative to these workers' incomes.

Our paper builds on and contributes to several strands of literature. While capital income taxation has been exhaustively studied (see, e.g., Judd, 1985; Chamley, 1986; Conesa et al., 2009; Straub and Werning, 2015), wealth taxation has received less extensive treatment. Several quantitative papers have analyzed the effects of estate taxes (Cagetti and De Nardi, 2009; Benhabib et al., 2011) and proportional wealth taxes (Guvenen et al., 2018; Rotberg, 2019), and several empirical papers have studied the public-finance effects of progressive wealth taxes in other countries (Brulhart et al., 2016; Seim, 2017; Jakobsen et al., 2018; Londoño-Vélez and Ávila-Mehcha, 2018), but our paper is the first to study the impact of progressive wealth taxes in general equilibrium, the first to quantify the effects of such policies on wealth inequality and macroeconomic outcomes, and the first to illustrate their distributional welfare consequences.

Our paper is also the first to study how the nature of tax evasion shapes the effects of wealth taxes. Empirical studies report a wide range of estimates of the extent of wealth tax evasion. For example, Seim (2017) finds that in Sweden, a one-percentage-point increase in the wealth tax rate led to a 0.09 percent increase in evasion, whereas Brulhart et al. (2016) report an estimated elasticity of wealth tax evasion of 24 percent for Swizerland. In their analysis of Senator Warren's proposed wealth tax, Saez and Zucman

(2019a,b) use an elasticity of 7.5, which is the average of the estimates in the literature. We build on these studies by showing that an empirically-plausible level of wealth tax evasion can have significant adverse macroeconomic consequences if it causes capital to move offshore and out of domestic production.

Finally, our paper is the first to analyze the effects of fiscal policy on transition dynamics using an overlapping generations model with a realistic demographic structure and occupational choice. Other quantitative public-finance papers either restrict their attention to long-run analyses (see, e.g., Conesa et al., 2009; Guvenen et al., 2018) or study transitions in simpler environments without these features (see, e.g., Cagetti and De Nardi, 2009). We show that these features are crucial for measuring the consequences of tax policy changes and that these consequences can differ significantly between the short run and the long run.

2 Model

The model economy features overlapping generations of finitely-lived households, competitive firms, and a government. Households in each cohort are heterogeneous in labor market ability, entrepreneurial ability, and wealth. Before retirement, households can work in the labor market or as entrepreneurs, and after retirement they receive social security benefits from the government. Households use their wealth to save at an exogenous interest rate r[1] for retirement and bequests to their offspring. Entrepreneurs also use their wealth as collateral to finance their capital expenditures; wealthier entrepreneurs can operate larger businesses, and more skilled entrepreneurs earn greater rates of return on their wealth. Entrepreneurs sell their output to competitive firms, which combine this output with labor to produce final goods.

The government finances its transfers to households by levying taxes on income, consumption, and wealth. The government cannot perfectly enforce wealth taxes, however; households hide a portion of their taxable wealth, and the extent of this tax evasion increases with the wealth tax rate. We consider two specifications of our model with different forms of wealth tax evasion. In the first specification, hidden wealth remains onshore and entrepreneurs can borrow against this wealth to finance their capital expenditures. In second, hidden wealth is held offshore and entrepreneurs cannot borrow against it; in this case, wealth taxation reduces capital expenditures—and consequently, output and wages—even if households' saving behavior does not change.

2.1 Demographics

Households are born at age $j = 0$, retire at age $j = R$, and have a maximum lifespan of J years. They face mortality risk, however, and may die at a younger age. The probability that a household of age j will survive to reach age $j + 1$ is ϕ_j; households that reach the maximum age have a survival probability of $\phi_J = 0$. When a household dies, it is replaced by a newborn household that inherits the dying household's wealth, which

[1] Our baseline model is a small open economy in which the interest rate is exogenous and constant over time. In our sensitivity analysis, we consider a version of our model with an endogenous interest rate and show that our main results are robust to this assumption.

we denote by $a \in \mathcal{A} = \mathbb{R}_+$. Households derive utility from the consumption of their offspring as well as their own consumption—they discount both at the same rate, β—and so these bequests are intentional, not accidental.

2.2 Skill endowments

In addition to wealth inherited from their parents, newborn households are endowed with a labor market ability, $e \in \mathcal{E} = \mathbb{R}_{++}$, and an entrepreneurial ability, $z \in \mathcal{Z} = \mathbb{R}_{++}$, that determine their income in each of the two occupations from which they can choose. We denote by $\Psi_{j,t}(e, z, a)$ the measure of age-j households over abilities and wealth in period t, and we use $\mathcal{S} = \mathcal{E} \times \mathcal{Z} \times \mathcal{A}$ to denote the household's state space.

Newborn households draw their initial labor market abilities from a distribution $F(e)$. Until retirement, households' labor market abilities are subject to idiosyncratic shocks, which follow a Markov process $F(e'|e)$; the newborns' distribution is the ergodic distribution associated with this process. Labor market income is also influenced by a deterministic, life-cycle component, ζ_j, that increases over time; a household of age j with labor market ability e can supply $e\zeta_j$ efficiency units of labor.

Unlike labor market abilities, entrepreneurial abilities are persistent, but not perfectly so, across generations. Newborn households draw their entrepreneurial abilities from a distribution $G(z^{\text{offspring}}|z^{\text{parent}})$ such that $G(\cdot|z_1)$ first order stochastically dominates $G(\cdot|z_2)$ if $z_1 > z_2$. Once drawn, households' entrepreneurial abilities are constant over their lives.

2.3 Taxes, transfers, and tax evasion

The government levies proportional taxes, τ_r, τ_k, and τ_c on interest income, capital income, and consumption respectively, and a progressive labor income tax, $\tau_{\ell,j}(e)$, that depends on both the deterministic and stochastic components of a household's labor market ability. The government also levies a tax, τ_a, on household wealth above a threshold, $\bar{a}$, and a surtax of τ_a' on wealth above a higher threshold, $\bar{a}'$. The government purchases goods, G, pays a social security benefit, B, to each retiree, and pays a lump-sum transfer, T_t, to each household. Note that we allow the transfer to be time-dependent; in our quantitative analysis this transfer changes over time as wealth tax revenues evolve.

Unlike the income and consumption taxes, the government cannot perfectly enforce the wealth tax. A household with wealth $a > \bar{a}$ hides a portion of its taxable wealth that depends on the rate at which this wealth is taxed. The household hides a fraction $\xi\tau_a$ of its wealth between the two thresholds, and a fraction $\xi(\tau_a + \tau_a')$ of its wealth above the higher threshold. The parameter ξ governs the elasticity of wealth tax evasion with respect to the tax rate; a higher tax rate induces more evasion. Formally, we denote the household's hidden wealth by

$$\tilde{a}(a) = \max(a - \bar{a}, 0)\xi\tau_a + \max(a - \bar{a}', 0)\xi\tau_a'. \tag{1}$$

The household's wealth tax liability, which we denote by $\tilde{\tau}_a(a)$, is

$$\tilde{\tau}_a(a) = \tau_a \left[\max(a - \bar{a}, 0)(1 - \xi\tau_a)\right] + \tau_a' \left[\max(a - \bar{a}', 0)(1 - \xi\tau_a')\right]. \tag{2}$$

We analyze two versions of our model that differ in the way that households can deploy their hidden wealth in financial markets. In the first specification, households can use all of their wealth, regardless of whether or not it is hidden, to earn interest and finance capital expenditures. In the second specification, by contrast, households cannot use their hidden wealth for these purposes. Formally, we define $\hat{a}(a)$ as a household's deployable wealth:

$$\hat{a}(a) = \begin{cases} a & \text{in specification 1} \\ a - \tilde{a} & \text{in specification 2} \end{cases}. \tag{3}$$

2.4 Occupational choice

Households earn income by working in the labor market or as entrepreneurs and by earning interest on their savings. Workers earn a wage W_t for each efficiency unit they supply to the labor market, and they supply all of the efficiency units with which they are endowed.[2] A worker of age j with labor market ability e and wealth a earns labor income $W_t e \zeta_j$ and interest income $r\hat{a}(a)$. Its after-tax net income is given by

$$y_{\ell,j,t}(e, a) = (1 - \tau_{\ell,j}(e))W_t e \zeta_j + r(1 - \tau_r)\hat{a}(a). \tag{4}$$

Entrepreneurs use capital to produce differentiated varieties of intermediate goods that they sell to final goods producers as in Guvenen et al. (2018). An entrepreneur with ability z that rents k units of capital produces $x = zk$ intermediate goods, which it sells at a price $p_t(x)$ which we characterize shortly below. Entrepreneurs can self-finance their capital expenditures or, if these expenditures exceed their usable wealth $\hat{a}(a)$, through intra-period borrowing. Entrepreneurs that choose to borrow face a collateral constraint,

$$k \leq \bar{b}(z, \hat{a}(a)). \tag{5}$$

Following Buera et al. (2011), we allow this constraint to depend on an entrepreneur's ability as well as their usable wealth to capture the possibility that more skilled entrepreneurs can credibly repay larger loans. Entrepreneurs that self-finance earn interest income on any wealth in excess of their capital. After choosing a method of financing, an entrepreneur chooses its capital expenditures to maximize its income net of taxes on business and interest income. The net income of an entrepreneur with ability z and wealth a can be written

[2] We do not model endogenous labor supply decisions. A model with endogenous labor supply would yield similar quantitative results to our model because the policy change that we analyze has modest effects on the wage rate, which in turn would have little impact on workers' labor supply decisions with a realistically-calibrated labor supply elasticity.

as

$$y_{k,t}(z,a) = \max_{k \le \bar{b}(z,\hat{a}(a))} \left\{ (1-\tau_k) \left[p_t(zk)zk - \delta k - r \max\left(k - \hat{a}(a), 0\right) \right] + (1-\tau_r) r \max\left(\hat{a}(a) - k, 0\right) \right\}. \tag{6}$$

The first term in this expression represents net business income, and the second term represents net interest income for entrepreneurs that self-finance.

Each year before retirement, households make a static choice: select the occupation with the highest net income.[3] After retirement, households receive social security transfers, B, from the government and earn interest income on their wealth. All households receive a lump-sum transfer, T_t. The net income of an age-j household with abilities (e, z) and wealth a is given by

$$y_{j,t}(e,z,a) = \begin{cases} \max\{y_{\ell,j,t}(e,a), y_{k,t}(z,a)\} + T_t & j < R \\ B + (1-\tau_r) r \hat{a}(a) + T_t & j \ge R \end{cases}. \tag{7}$$

We use $\ell_{j,t}(e,z,a)$ and $x_{j,t}(e,z,a)$ to denote a household's supply of labor and intermediate goods in its chosen occupation. For workers, $\ell_{j,t}(e,z,a) = e\zeta_j$ and $x_{j,t}(e,z,a) = 0$. For entrepreneurs, $\ell_{j,t}(e,z,a) = 0$ and $x_{j,t}(e,z,a) = zk_t(z,a)$. For retirees, $\ell_{j,t}(e,z,a) = x_{j,t}(e,z,a) = 0$. It is also useful to define a household's total income tax liability, which we can use these policy functions to write as

$$\begin{aligned} \tau_{j,t}(e,z,a) = {} & \tau_{j,\ell}(e) W_t \ell_{j,t}(e,z,a) \\ & + \tau_k \left\{ x_{j,t}(e,z,a) \left[p_t(x_{j,t}(e,z,a)) - \delta/z \right] - r \max\left(x_{j,t}(e,z,a)/z - \hat{a}(a), 0 \right) \right\} \\ & + \tau_r r \max\left(\hat{a}(a) - x_{j,t}(e,z,a)/z), 0 \right). \end{aligned} \tag{8}$$

2.5 Wealth accumulation

After choosing its occupation and paying its income taxes, a household pays its wealth tax and makes a dynamic decision: how much to save. The dynamic program that represents this problem is

$$\begin{aligned} V_{j,t}(e,z,a) = \max_{c,a' \ge 0} \Bigg\{ & u(c) + \beta\phi_j \int_{\mathcal{E}} V_{j+1,t+1}(e',z,a')\, \mathrm{d}F(e'|e) \\ & + \beta(1-\phi_j) \int_{\mathcal{E}\times\mathcal{Z}} V_{0,t+1}(e',z',a')\, \mathrm{d}F(e')\, \mathrm{d}G(z'|z), \Bigg\} \end{aligned} \tag{9}$$

subject to

$$(1+\tau_c)c + a' + \tilde{\tau}_a(a) = y_{j,t}(e,z,a). \tag{10}$$

[3] We allow households to freely change their occupations throughout their working lives, but households' occupations are highly persistent, just as they would be if there was a sunk cost of changing occupations. This is because entrepreneurial ability is constant over each household's life, and so once a household has accumulated enough wealth to make entrepreneurship more attractive than working, it almost always remains an entrepreneur until retirement.

The household's continuation value consists of two parts. The first, which is multiplied by the survival probability, ϕ_j, represents the value of surviving and living to age $j+1$.[4] The second component, which is multiplied by the death probability, $1-\phi_j$, represents the expected lifetime utility of the household's offspring. We denote the optimal saving and consumption policies by $a'_{j,t}(e,z,a)$ and $c_{j,t}(e,z,a)$.

2.6 Aggregation

The final good, Y_t, is produced using labor hired from workers and intermediate goods purchased from entrepreneurs according to the technology,

$$Y_t = X_t^{\alpha} L_t^{1-\alpha}, \tag{11}$$

where

$$X_t = \left(\sum_{j=0}^{J} \int_{\mathcal{S}} x_{j,t}(e,z,a)^{\nu} \, \mathrm{d}\Psi_{j,t}(e,z,a) \right)^{\frac{1}{\nu}}, \tag{12}$$

$$L_t = \sum_{j=0}^{J} \int_{\mathcal{S}} \ell_{j,t}(e,z,a) \, \mathrm{d}\Psi_{j,t}(e,z,a). \tag{13}$$

As in Guvenen et al. (2018), X_t is a CES bundle of entrepreneurs' differentiated intermediate goods; the parameter ν governs the elasticity of substitution between these goods. We refer to X_t as the aggregate effective capital stock. Final-goods producers are competitive, and choose inputs of these factors to maximize profits taking the wage, W_t, and the price of each intermediate variety, $p_t(x)$, as given. The first-order conditions that characterize a final-goods producer's demand for labor and intermediates are

$$p_t(x_{j,t}(e,z,a)) = \alpha X_t^{\alpha-\nu} L_t^{1-\alpha} x_{j,t}(e,z,a)^{\nu-1}, \tag{14}$$

$$W_t = (1-\alpha) X_t^{\alpha} L_t^{-\alpha}. \tag{15}$$

In our calibration, where $\alpha < \nu$, entrepreneurs receive higher prices for their varieties when the aggregate intermediate bundle, X_t, is smaller; when there is less competition, entrepreneurs can charge higher prices and earn greater returns on their wealth.

We require that the government's budget balance period by period. The government's budget constraint,

$$G + \sum_{j=R}^{J} \int_{\mathcal{S}} B \, \mathrm{d}\Psi_{j,t}(e,z,a) = \sum_{j=0}^{J} \int_{\mathcal{S}} \left(\tau_{j,t}(e,z,a) + \tau_c c_{j,t}(e,z,a) + \tilde{\tau}_a(a) - T_t \right) \, \mathrm{d}\Psi_{j,t}(e,z,a), \tag{16}$$

[4] We include labor market ability shocks for retired households as well as non-retired households in our formulation of the dynamic program for notational brevity. Labor market ability is irrelevant for retired households since it does not affect their income and there is no inter-generational labor market ability correlation, but writing the dynamic program this way allows us to use a single equation to represent both retired and non-retired households' problems.

states that government consumption expenditures and social security benefit payments must equal revenues from income taxes, consumption taxes, and wealth taxes less transfers. When we calibrate the model to the current U.S. tax code we choose the level of government consumption, G, to ensure that this constraint holds. When we introduce a progressive wealth tax the level of transfers, T_t, adjusts to ensure budget balance.

The measure of households evolves according to a law of motion that is characterized by two equations:

$$\Psi_{j+1,t+1}(E \times Z \times A) = \phi_j \int_{\mathcal{S}} \left[\int_E \mathrm{d}F(e'|e) \right] \mathbb{1}_{\left\{a'_{j,t}(e,z,a) \in A\right\}} \mathbb{1}_{\{z \in Z\}} \mathrm{d}\Psi_{j,t}(e,z,a), \; j < J, \tag{17}$$

$$\Psi_{0,t+1}(E \times Z \times A) = \sum_{j=0}^{J} (1-\phi_j) \int_{\mathcal{S}} \left[\int_{E \times Z} \mathrm{d}F(e'|e) \mathrm{d}G(z'|z) \right] \mathbb{1}_{\left\{a'_{j,t}(e,z,a) \in A\right\}} \mathrm{d}\Psi_{j,t}(e,z,a), \tag{18}$$

where E, Z, and A are typical subsets of $\mathcal{E}$, $\mathcal{Z}$, and $\mathcal{A}$, respectively. Equation (17) dictates how the measures of surviving non-newborn households evolve over time, and equation (18) dictates how the measure of newborn households evolves as a result of other households' deaths.

2.7 Equilibrium

An equilibrium in our model is a sequence of aggregate prices and quantities, $\{W_t, L_t, X_t, Y_t\}_{t=0}^{\infty}$, a sequence of value and policy functions, $\left\{ \left(V_{j,t}(\cdot), \ell_{j,t}(\cdot), x_{j,t}(\cdot), a'_{j,t}(\cdot) \right)_{j=0}^{J} \right\}_{t=0}^{\infty}$, and a sequence of measures, $\left\{ \left(\Psi_{j,t}(\cdot) \right)_{j=0}^{J} \right\}_{t=0}^{\infty}$, that

1. solve the household's static and dynamic problems, (7)–(9);
2. satisfy the representative firm's first-order conditions, (14)–(15);
3. satisfy the government's budget constraint, (16);
4. and satisfy the law of motion for the distribution of households, (17)–(18).

In the long run, an equilibrium always converges to a stationary equilibrium in which the objects listed above are constant over time, and each set of parameter values is associated with a unique stationary equilibrium. The nature and length of the transition to a stationary equilibrium is determined by the distance of the initial distribution, $\left(\Psi_{j,0}(\cdot) \right)_{j=0}^{J}$, from its stationary counterpart.

3 Calibration

We calibrate our model so that its stationary equilibrium under the current U.S. tax code, which does not include a wealth tax, replicates the share of wealth held by the top 0.1 percent of households and other facts about the U.S. economy. We refer to this stationary equilibrium as the no-wealth-tax benchmark equilibrium or the benchmark equilibrium for short. Our calibration proceeds in two stages. First, we assign standard values to common parameters like the capital share and the depreciation rate, and apply estimates from other studies for parameters that have clear empirical counterparts. Second, we jointly calibrate the remaining parameters so that the model matches several additional moments from U.S. data. Our no-wealth-tax benchmark equilibrium closely matches the entire wealth distribution, not just the concentration of wealth among the richest households, and a number of other relevant statistics that we do not target in our calibration.

3.1 Assigned parameters

Table 1 lists the assigned parameter values, which we break into several groups.

3.1.1 Demographics and preferences

Households are born at age 25, retire at age 66, and can reach a maximum age of 85, which implies $R = 20$ and $J = 60$. We set the survival probabilities, ϕ_j, using the 2010 United States Life Tables (Arias, 2014). We assume that households have CRRA utility, $u(c) = c^{1-\sigma}/(1-\sigma)$, and set $\sigma = 2$. The other preference parameter, the discount factor, β, is determined in the second stage of our calibration procedure.

3.1.2 Labor market ability

We use a discrete process for the stochastic component of labor market ability, e, with four possible states: $\mathcal{E} = \{e_1, \ldots, e_4\}$. The first three states represent the bottom three quintiles of the U.S. labor income distribution, and the fourth state represents the top 40 percent. We set the probabilities that newborn households draw these states to reflect this mapping: $F(e) = \{0.2, 0.2, 0.2, 0.4\}$. We set the values of these states using U.S. Census data (McNeil, 2001) on each quintile's share of equivalized household labor income. To set the transition probabilities, we use the estimates of Burkhauser et al. (1997) of the probability of moving down one quintile in the labor income distribution; we assume that households cannot move up or down more than one quintile in a single year, and set the probabilities of moving up a quintile so that the mass of households in each state is constant. This approach ensures that our model matches the fraction of low-income households, the income of these households relative to other households in the economy, and the rate at which households move into and out of this group, which in turn ensures that low-income households correctly value the lump-sum transfers of wealth tax revenue.[5]

We set the deterministic life-cycle component of labor market ability to $\zeta_j = 1 + \min\{0.38j/30, 0.38\}$ to match Guvenen et al. (2019)'s finding that households' labor income rises by 38 percent by age 55 and then grows little thereafter.

3.1.3 Production and entrepreneurial ability

We follow Guvenen et al. (2018)'s calibration of the aggregate production technology and inter-generational transmission of entrepreneurial ability. We set the capital share, α, to 0.4, the depreciation rate, δ, to 5 percent, and the curvature parameter, ν, to 0.9. We assume that entrepreneurial ability follows an AR(1) process

[5] We have also analyzed a version of our model with a an AR(1) process for labor market ability, which yields similar results but requires a larger number of states, reducing its numerical tractability.

across generations,

$$\log z^{\text{offspring}} = \rho_z \log z^{\text{parent}} + \epsilon_z, \quad \epsilon_z \sim N(0, \sigma_z), \tag{19}$$

and set $\rho_z = 0.15$ based on the estimates of Fagereng et al. (2018). The dispersion parameter, σ_z, and the collateral constraint, $\bar{b}(z, \hat{a}(a))$, are determined in the second stage of our calibration procedure.

3.1.4 Taxes and interest rates

We set the wealth tax rates, τ_a and τ_a', to zero, since the goal of the calibration exercise is to construct stationary equilibrium that represents the U.S. economy under the current U.S. tax code. The wealth tax thresholds, $\bar{a}$ and $\bar{a}'$, and the wealth tax evasion elasticity, ξ, are irrelevant in our calibration; we discuss our assignment of these parameters in section 4 below. We set the consumption tax, τ_c, and the capital income tax, τ_k, to McDaniel (2007)'s estimates of 7.5 percent and 25 percent, respectively. We set the investment income tax, τ_v, to the long-term capital gains tax rate of 15 percent. We set the labor income tax rates, $\tau_{\ell,j}(e)$, to match the average effective tax rate for each age and labor income quintile; the overall average labor income tax rate is close to McDaniel (2007)'s estimate of 22 percent.

We set the social security benefit, B, to 40 percent of the average labor income as reported by the U.S. Social Security Administration. We set transfers, T_t, to zero and set government expenditures, G, so that the government's budget clears; the government consumes the difference between tax revenues and social security benefits. Finally, we set the interest rate, r, to 0.8 percent as in Mehra and Prescott (1985).

3.2 Calibrated parameters

After assigning the parameter values listed above, there are three model ingredients that still must be calibrated: σ_z, the dispersion of entrepreneurial abilities; $\bar{b}(z, \hat{a}(z))$, the collateral constraint; and β, the discount factor. Following Guvenen et al. (2018), we discretize the entrepreneurial ability process and parameterize the collateral constraint as

$$\bar{b}(z_k, \hat{a}(a)) = \left[1 + \lambda \left(\frac{k-1}{\#\mathcal{Z} - 1}\right)\right] \hat{a}(a), \; k = 1, \ldots, \#\mathcal{Z}. \tag{20}$$

The parameter λ governs the extent to which higher-ability entrepreneurs can borrow more against their wealth.

We jointly calibrate σ_z, λ, and β to match three moments from U.S. data: the share of wealth held by the top 0.1 percent of households; the ratio of aggregate net wealth to GDP; and the average ratio of debt to assets for private firms. The first two statistics come from the most recent wave of the Survey of Consumer Finances (SCF). According to the survey, the top 0.1 percent of households hold 15 percent of total household net wealth and net wealth is 4.79 times GDP. The third statistic comes from Asker et al. (2011), who estimate that the average private firm's debt-assets ratio is 0.31. Each of these parameters effects all three moments to some degree. Roughly speaking, however, β controls the net wealth-GDP ratio, σ_z controls the top 0.1 percent share, and λ controls the debt-assets ratio. The calibrated model matches all three moments exactly. Table 2 lists the values of the jointly calibrated parameters.

3.3 Non-targeted moments

Our calibrated model matches a number of other relevant statistics from U.S. data that we do not target in our calibration. Although we target only the share of wealth held by the top 0.1 percent of households, our model matches other quantiles at the top of the wealth distribution closely, ensuring that it accurately captures the wealth tax base. We also match estimates in the literature of the entrepreneurship rate, the average gross return to capital, and the composition of government revenues. Lastly, the model also accurately matches the size of bequests relative to aggregate net wealth, which makes us confident in the model's ability to account for realistic behavioral responses to the wealth tax. These statistics are reported in table 3.

4 Quantitative analysis

Having described the model and its calibration, we turn now to our analysis of the effects of taxing the wealthy. Starting from the no-wealth-tax benchmark equilibrium, we make permanent, unanticipated changes to the wealth tax parameters, τ_a, τ_a', $\bar{a}$, $\bar{a}'$, to implement a progressive wealth tax and analyze the model economy's transition to its new steady state. We solve for the transition under both wealth tax evasion specifications outlined in section 2.3. In the first, hidden wealth remains onshore and entrepreneurs can borrow against it to finance their capital expenditures. In the second specification, hidden wealth is moved offshore, taking capital out of domestic production. Table 4 summarizes the effects of the policy change on public finances, macroeconomic variables, inequality, and welfare at different time horizons, and figures 2–5 provide visual depictions of the transition dynamics.

4.1 Wealth tax implementation

We set the wealth tax rates, τ_a and τ_a', and the thresholds, $\bar{a}$ and $\bar{a}'$, to capture U.S. Senator Elizabeth Warren's policy proposal analyzed by Saez and Zucman (2019b), which would levy a tax of two percent on wealth above 50 million dollars and a surtax of one percent on wealth above one billion dollars. We set τ_a to two percent and τ_a' to one percent, and $\bar{a}$ and $\bar{a}'$ to the model equivalents of 50 million dollars and one billion dollars, respectively. We set the wealth tax evasion elasticity, ξ, to 7.5 percent based on the estimates of Saez and Zucman (2019b).[6]

[6] This value is the average of the estimated elasticities for Sweden, Denmark, Colombia, and Switzerland, countries which have introduced progressive wealth taxes in the past. Note, however, that the elasticities for Sweden and Denmark are less than 0.5, and Colombia's elasticity is less than 3. Switzerland's elasticity of more than 30 is due to that country's bank secrecy laws. Thus, the average of 7.5 likely represents a conservative estimate of the wealth tax base in the United States.

We assume that the social security benefit, B, is fixed at its benchmark value; it does not change as wages, and thus average labor income, change as the economy transitions to its new steady state. Government consumption, G, is also unchanged. Consequently, the transfer, T_t, distributes the wealth tax revenues plus the change in revenues from other sources equally among households. Note that if income and consumption tax revenues fall when the wealth tax is implemented, this decline eats up some of the wealth tax revenues. Formally, we compute the lump-sum transfer in two equivalent ways as

$$\begin{aligned} T_t &= \sum_{j=0}^{J} \int_{\mathcal{S}} \left(\tau_{j,t}(e,z,a) + \tau_c c_{j,t}(e,z,a) + \tilde{\tau}_a(a)\right) \, \mathrm{d}\Psi_{j,t}(e,z,a) - \sum_{j=R}^{J} \int_{\mathcal{S}} B \mathrm{d}\Psi_{j,t}(e,z,a) - G \\ &= \sum_{j=0}^{J} \int_{\mathcal{S}} \left(\tau_{j,t}(e,z,a) + \tau_c c_{j,t}(e,z,a) + \tilde{\tau}_a(a)\right) \, \mathrm{d}\Psi_{j,t}(e,z,a) - \sum_{j=0}^{J} \int_{\mathcal{S}} \left(\tau^*_j(e,z,a) + \tau_c c^*_j(e,z,a)\right) \, \mathrm{d}\Psi^*_j(e,z,a), \end{aligned} \tag{21}$$

where stars denote policy functions and distributions from the no-wealth-tax benchmark equilibrium.

4.2 Inequality and public finances

We begin our analysis with a discussion of the policy's ability to raise revenue and reduce wealth inequality, the stated goals of many proponents of progressive wealth taxation.

Figure 2 and columns 2–3 of table 4 illustrate the effects of the wealth tax on public finances. In the short run, the tax raises about 0.63 percent of GDP in revenue in both tax evasion specifications that we consider.[7] Slightly less than 0.1 percent of households are subject to the tax, similar to the estimate of Saez and Zucman (2019b). Over time, however, wealth tax revenues fall dramatically. After ten years, revenues fall by 14 percent in the first tax evasion specification, in which hidden wealth remains onshore, and 19 percent in the second specification, in which hidden wealth moves offshore. In the long run, revenues fall by 47 percent in the first specification and 60 percent in the second specification. Thus, although the revenues raised during the policy's first decade would only be modestly lower than first-year revenues, the policy would raise substantially less revenues in the long run, particularly if tax evasion causes rich households to shift some of their wealth offshore.

In the short run, the revenues generated by the wealth tax would finance transfers of 0.96 percent of the average labor income in the first tax evasion specification and 0.88 percent in the second specification. Although short-run wealth tax revenues are about the same in both specifications, there is an immediate macroeconomic response in the second specification that reduces income and consumption tax revenues; we discuss macroeconomic dynamics in more detail in the next section.[8] Over the course of the transition,

[7] This figure is less than the 1 percent of GDP estimated by Saez and Zucman (2019b) because their analysis uses a more skewed wealth distribution. They manually merge the Forbes 400 with the SCF, yielding a wealth distribution in which the top 0.1 percent of households hold 20 percent of total net wealth; in our analysis, which uses only the SCF, this share is 15 percent. In section 5.2, we present results from an alternative calibration in which we target a higher top 0.1 percent share. When using this target the model generates the same 1 percent of GDP in wealth tax revenues.

[8] Because output drops immediately in the second specification, the ratio of wealth tax revenues to GDP in the short-run is higher than in the first specification.

transfers decline more than revenues, falling by 59 percent in the first specification and 74 percent in the second.

Figure 3 and columns 6–7 of table 4 show the effects of the policy change on wealth inequality. In the short run, there is no effect on wealth inequality in either specification because the wealth distribution has yet to evolve; the initial wealth distribution in this exercise, $\left(\Psi_{j,0}(\cdot)\right)_{j=0}^{J}$, is the same as the no-wealth-tax benchmark distribution by construction. Over the course of the transition, the share of wealth held by the top 0.1 percent of households falls gradually but substantially. In the long run, it falls by 3.5 percentage points (or about a quarter) in the first specification and by 4.6 percentage points (or about a third) in the second specification. In the latter case, rich households' inability to leverage their hidden wealth to earn high entrepreneurial returns reduces their ability—and thus their incentive—to accumulate wealth, and so their share of wealth falls more dramatically. The reduction in wealth concentration at the top of the distribution has little effect on wealth inequality among other households, however; the Gini coefficient of wealth barely changes in either scenario.

The results of our analysis of the effect of a progressive wealth tax on public finances and inequality highlight a tension between the two goals of many proponents of this kind of policy. As the wealth distribution evolves over the course of the transition and the concentration of wealth declines, the total amount of taxable wealth above the policy's thresholds falls. Thus, as the effect of the tax on wealth inequality grows stronger, the tax's ability to generate revenues grows weaker. This tension is stronger in the second specification, in which hidden wealth is held offshore, because the policy has a more pronounced effect on rich households' abilities and incentives to accumulate wealth.

4.3 Macroeconomic dynamics

Figure 4 and columns 4–5 of table 4 depict the effects of the wealth tax on macroeconomic variables. There are two channels through which the policy affects the macroeconomy. First, the policy reduces rich households' wealth, which in turn reduces the amount of capital that these households employ in their businesses; the richest households in our model are high-skill entrepreneurs. Consequently, aggregate capital, output, and wages fall. The second channel operates only in the second evasion specification, in which hidden wealth is held offshore. In this case, rich households' deployable wealth, $\hat{a}(a)$, falls more than their overall wealth, further reducing their entrepreneurial capital and further reducing macroeconomic aggregates.

Macroeconomic transition dynamics differ markedly across the two evasion specifications. In the first specification, in which only the first channel operates, there is no short-run macroeconomic effect at all. Over time, GDP, capital, and wages fall gradually as rich households' wealth declines. In this specification, GDP falls by 0.63 percent in the long run and wages fall by 0.43 percent. In the second specification, in which both channels operate, output and wages fall in the short run as soon as the policy is implemented; GDP and wages both fall by 0.48 percent in the first period of the transition. This immediate decline in macroeconomic activity reduces income and consumption revenues, which explains why the wealth tax generates smaller transfers in the short run in this specification as discussed above. Over the course of the transition, the first channel also begins to operate as rich households' wealth declines, amplifying the policy's macroeconomic impact. In the long run, GDP falls by 0.90 percent and wages fall by 0.56 percent in this specification. As we discuss in the next section, the long-run drop in labor income in this specification is larger than the lump-sum transfer for many households, and consequently many households' welfare falls in the long run.

Before turning to the welfare analysis, however, note that macroeconomic dynamics exhibit significant overshooting in both specifications: GDP and wages fall for the first fifty years after the policy is implemented and then recover gradually for the remainder of the transition. The fact that the macroeconomic effects of the wealth tax are most pronounced in the medium run, rather than the long run, plays an important role in shaping the policy's welfare implications and indicates that analyzing transition dynamics, not just long-run changes, is important to accurately quantify the policy's consequences.

4.4 Welfare

Our measure of aggregate welfare is similar to that of Conesa et al. (2009): the ex-ante welfare of a household randomly placed into the economy at a given point in time. We include all households, not just newborns, in our welfare measure to reflect the fact that households in our model care about their offspring as well as themselves. The aggregate consumption-equivalent welfare effect of the wealth tax after t periods is given by

$$CE_t = \left[\frac{\sum_{j=0}^{J} \int_{\mathcal{S}} V_{j,t}(e,z,a) \, \mathrm{d}\Psi_{j,t}(e,z,a)}{\sum_{j=0}^{J} \int_{\mathcal{S}} V_j^*(e,z,a) \, \mathrm{d}\Psi_j^*(e,z,a)} \right]^{\frac{1}{1-\sigma}} - 1, \tag{22}$$

where, once again, stars denote equilibrium objects in the no-wealth-tax benchmark. Note that the welfare effect in a given period t reflects the transition dynamics that occur from that period onward; the welfare effect in the first period after the tax is implemented reflects the entire transition. We also measure the fraction of households who approve of the policy change, i.e. the fraction of households for whom $V_{j,t}(e,a,z) > V_j^*(e,a,z)$; here, we hold the distribution constant at its initial value, $\left(\Psi_j^*(\cdot)\right)_{j=0}^{J}$.

The last two columns of table 4 list the results of our welfare calculations. In the period in which the policy is implemented, welfare rises by 0.64 percent in the first specification and 0.58 percent in the second, but welfare gains decline over time as transfers and wages fall. The long-run welfare gain is 36 percent lower than the overall welfare gain in the first specification and 69 percent lower in the second specification. Welfare gains do not decline monotonically, however; the overshooting in macroeconomic dynamics shown in figure 4 carries over into welfare as well. A household placed randomly into the distribution fifty years after the policy is implemented is worse off than a household randomly placed into the long-run distribution. The welfare effect of the policy change is positive in every period of the transition in both tax evasion specifications, however.

In the first specification, almost all households approve of the policy change in the short run, the medium run, and the long run. In the first ten years after the wealth tax is implemented, 99.88 percent of households approve of the policy. The remaining 0.12 percent represent the households that are directly hit by the tax and some households that are close to reaching the wealth tax threshold $\bar{a}$. After fifty periods, more than 11 percent of households disapprove of the policy, but in the long run the approval rate rises back to 99.88 percent; in both the short run and the long run, all households that do not anticipate paying the tax in their lifetimes approve of the policy change. Approval dynamics are strikingly different in the second specification. Although the policy enjoys a similar approval rate in the first period of the transition in both specifications, the approval rate falls dramatically—and permanently—in the second specification. After fifty periods, only a slim majority approve of the policy, and the approval rate only recovers slightly from this point in the long run.

Although there are sharp quantitative differences in welfare gains and approval between the two specifications, our results indicate that introducing a progressive wealth tax always raises aggregate welfare and is always approved of by a majority of households. However, these overall welfare results hide several key facts about how the welfare effects of the policy change are distributed.

Table 5 shows how the policy affects households of different ages and entrepreneurial abilities. We compute consumption-equivalent changes in ex-ante welfare conditional on entering the economy in a particular age group, $\mathcal{J} \subset \{0, \dots, J\}$, and with a particular entrepreneurial ability, z, as

$$CE_{\mathcal{J},t}(z) = \left[\frac{\sum_{j\in\mathcal{J}} \int_{\mathcal{E}\times\mathcal{A}} V_{j,t}(e,z,a) \, \mathrm{d}\Psi_{j,t}(e,z,a)}{\sum_{j\in\mathcal{J}} \int_{\mathcal{E}\times\mathcal{A}} V_j^*(e,z,a) \, \mathrm{d}\Psi_j^*(e,z,a)} \right]^{\frac{1}{1-\sigma}} - 1. \tag{23}$$

We focus our discussion on short- and long-run effects for brevity; the left half of the table reports short-run measures, $CE_{\mathcal{J},0}(z)$, and the right half reports long-run measures, $CE_{\mathcal{J},\infty}(z)$. In the first tax evasion specification, the distribution of welfare effects is qualitatively similar in both the short run and the long run. Older households with the highest entrepreneurial abilities lose, and all other groups of households gain. The oldest households with the highest abilities who bear the brunt of the tax burden directly see significant welfare losses that reflect the curvature—or lack thereof—of these households' utility functions; only a large change in consumption has a noticeable effect on their utility. Young, high-ability households actually gain from the policy change despite the fact that they are likely to pay the wealth tax when they become old. As we demonstrate in the next section below, this is due to the fact that the macroeconomic contraction induced by the policy reduces competition between entrepreneurs, increasing their income as suggested by Saez and Zucman (2019a).

In the second specification, there is a stark difference between the short-run and long-run results. The short-run effects on each group's welfare are similar to the short-run effects in the first specification, but in the long run all households with low entrepreneurial abilities are hurt by the policy. This is because wages fall further in the second specification, and the decline in labor income is larger than the transfer that many of these households receive from the wealth tax revenues. Further, young households with high entrepreneurial abilities (and all households with above-average abilities) gain more in the second specification than in the first, indicating that while a progressive wealth tax with this form of tax evasion hurts workers, it actually brings even greater benefits to many entrepreneurs. This happens because in the second specification, aggregate capital falls when rich households hide their wealth offshore, reducing competition between entrepreneurs more than in the first specification.

Table 6 shows how the policy affects newborn households of different ability types. Here, we compute the welfare of a newborn household that enters the economy with labor market ability e and entrepreneurial ability z as

$$CE_t(e,z) = \left[\frac{\int_{\mathcal{A}} V_{0,t}(e,z,a)\, \mathrm{d}\Psi_{0,t}(e,z,a)}{\int_{\mathcal{A}} V_j^*(e,z,a)\, \mathrm{d}\Psi_0^*(e,z,a)} \right]^{\frac{1}{1-\sigma}} - 1. \tag{24}$$

In the first tax evasion specification, all newborns gain in both the short run and the long run regardless of their ability type. In the second specification, however, all newborns gain in the short run but most households with average or lower entrepreneurial abilities lose. These households are workers, not entrepreneurs, and the large long-run decline in wages in this specification causes their labor income to fall more than the transfers they receive. Newborn households with the lowest labor market ability gain, albeit barely, because the transfer is larger relative to their income reduction. Newborn households with high entrepreneurial abilities gain more in the second specification than in the first in both the short run and the long run, for reasons we explained above.

Our welfare calculations highlight several key points about the welfare effects of a progressive wealth tax. Implementing this policy would increase aggregate welfare and would receive support from a majority of households regardless of whether or not evasion shifts capital offshore. However, in the long run it would harm many households that rely on labor income, and young, high-ability entrepreneurs would reap the majority of the policy's benefits. Progressive wealth tax advocates who argue that the benefits of this kind of policy would accrue primarily to low-income, low-wealth households should heed these conclusions carefully.

4.5 Entrepreneurship

Our results indicate that young households with high entrepreneurial abilities would benefit substantially from a progressive wealth tax, even though many of them would pay the tax when they become old. Moreover, these households' welfare gains are largest in the second tax evasion specification, which features a larger macroeconomic contraction and lower welfare gains (or larger losses) for all other households. Why would these households reap such a large share of the gains from this policy?

The key force driving this result is that by reducing the aggregate effective capital stock, X_t, a progressive wealth increases the price, $p_t(x)$, at which entrepreneurs can sell their intermediate goods, raising the returns that entrepreneurs earn on their wealth. To see this, panel (a) of figure 5 shows how the price of one unit of intermediate goods, which we define as $P_t = \alpha X_t^{\alpha-\nu} L_t^{1-\alpha}$, evolves over the course of the transition; note that $p_t(x) = P_t x^{\nu-1}$. In both tax evasion specifications, the price of intermediate goods rises over time, and in the second specification it rises immediately as hidden wealth that moves offshore is taken out of production. The economic intuition for this result is straightforward: entrepreneurs' differentiated goods are substitutes, and a reduction in aggregate output reduces competition, allowing entrepreneurs to obtain higher prices for their products.

As entrepreneurial income rises, entrepreneurship becomes more attractive. Panel (b) of figure 5 illustrates the transition dynamics of the entrepreneurship rate. In both specifications, the entrepreneurship rate rises over time with the price of intermediate goods, and in the second specification there is an immediate increase in entrepreneurship when the policy is implemented. This finding indicates that by reducing the concentration of wealth among the richest households, a progressive wealth tax would have a positive impact on entrepreneurship, especially among young households, confirming a hypothesis of Saez and Zucman (2019a) about a possible benefit of this kind of policy.

5 Sensitivity analysis

Our results indicate that a progressive wealth tax would raise government revenue, reduce wealth inequality, and enjoy popular support, but it could reduce many workers' welfare if tax evasion causes capital to move offshore, triggering a substantial macroeconomic contraction. In this section, we explore the role of general equilibrium forces in driving our results and the sensitivity of our findings to our modeling decisions and calibration strategy. Table 7 compares the long-run effects of the tax in our sensitivity analyses to the effects in our baseline quantitative exercise.[9]

5.1 The role of general equilibrium effects

Our results show that young entrepreneurs would benefit dramatically from a progressive wealth tax, even though many of these households would bear the brunt of the tax when they grow old. Conversely, workers would see only modest gains from this policy, and many workers would actually lose in the long run if tax evasion shifts capital offshore. The key forces driving these results are general equilibrium effects resulting from the macroeconomic contraction the policy would cause. Entrepreneurs would gain because the prices of their intermediate goods rise as competition from wealthy households falls. Workers, on the other hand, would benefit from transfers of wealth tax revenue but would also lose from a decline wages; in the second specification of our model the latter effect is stronger than the former for many workers.

We illustrate the roles of these general equilibrium forces in driving our results by conducting two partial equilibrium versions of our analysis in which we fix the wage, W_t, and the intermediate goods price,

[9] We restrict attention to long-run effects in this section for the sake of numerical tractability as well as brevity. Solving for transition dynamics is not feasible in several of our alternative model versions, and a transition equilibrium is not well-defined in our partial equilibrium exercises.

P_t, which we defined in section 4.5 above, when we introduce the wealth tax to our model economy. In the first partial equilibrium exercise, we hold the wage fixed at its no-wealth-tax benchmark value and set the intermediate goods price to the new, higher value from the stationary equilibrium with the wealth tax. In the second exercise, we do the reverse, fixing the intermediate goods price to its benchmark value and the wage at its new, lower value.

In the first partial equilibrium exercise, in which the wage remains constant at its benchmark value and the intermediate goods price rises, welfare gains are significantly higher than in the baseline general equilibrium analysis in both tax evasion specifications. In the second specification, the approval rate rises dramatically to 99.89 percent; all households except for those that pay the tax (or are likely to pay it soon), now approve of the policy. The left half of table 8 reports newborn households' long-run welfare gains by labor market and entrepreneurial abilities in this exercise. Here, all newborn households gain from the policy change in both specifications; recall that in the second specification of the baseline general equilibrium analysis, many households with low entrepreneurial abilities lose in the long run because the decline in their labor income is greater than the wealth tax revenue transfers they receive. In fact, as table 7 shows, transfers actually rise significantly because wealth tax revenues are no longer offset by a drop in income tax revenues. These larger transfers increase the welfare gains from the policy change for newborns with the lowest labor market abilities, in particular.

In the second partial equilibrium exercise, in which the intermediate goods price is held constant and the wage falls, welfare falls in both tax evasion specifications rather than rise. In fact, there are no households in the economy that approve of the policy change at all; as the right half of table 8 shows, welfare falls for newborn households of all ability types. Households with low entrepreneurial abilities see large welfare losses in this scenario not only because their wages fall, but also because the lump-sum transfer is negative as table 7 shows; the decline in tax revenue from other sources is larger than the increase in revenues from the wealth tax. Households with high entrepreneurial abilities lose in this version of the exercise because their business income no longer rises, they pay transfers to the government instead of receiving them, and pay the wealth tax itself when they become old and rich.

5.2 More concentrated wealth distribution

In our calibration, the dispersion of entrepreneurial abilities, σ_z, is determined primarily by a single target statistic: the share of aggregate wealth held by the top 0.1 percent of households. This statistic measures the depth of the wealth tax base; the more wealth held by households above the threshold $\bar{a}$, the more revenue the tax can raise. At the same time, however, if the richest households hold a larger share of the economy's wealth, the reduction in their saving—and the reduction in their deployable wealth in the second specification of our model—caused by the policy could have larger macroeconomic consequences. In our baseline analysis, we use data from the 2016 Survey of Consumer Finances to compute this statistic, measuring it at 15 percent. However, this dataset does not contain some of the United States' richest households. In their analysis of

Senator Warren's policy proposal, Saez and Zucman (2019b) manually add the Forbes 400 to the SCF and obtain a more concentrated wealth distribution in which the top 0.1 percent hold 20 percent of aggregate wealth. Here, we ask: how would our results change if we calibrated our model to match this higher level of wealth concentration?

In this version of our analysis, we recalibrate all three internally-calibrated parameters, σ_z, β, and λ so that our model still matches the other two target statistics in addition to the higher concentration of wealth. The wealth tax now raises 0.97 percent of GDP in revenue in the short run, almost exactly the same as the 1 percent of GDP estimated by Saez and Zucman (2019b).

As the fourth row of each panel in table 7 shows, all of our other results are stronger in this version of the analysis. Revenues decline as the wealth distribution evolves, but in the long run they remain more than 50 percent higher than in the baseline. This translates into larger lump-sum transfers, despite the fact that the macroeconomic contraction is larger in this version of the analysis. Inequality at the top of the wealth distribution falls further than in the baseline but, as before, wealth inequality among other households barely changes. Although the macroeconomic response is larger in this version of the analysis, welfare gains are larger and a strong majority of households approves of the policy in both tax evasion specifications. For workers, the larger lump-sum transfer outweighs the bigger decline in wages, and entrepreneurs benefit from a larger increase in the price of intermediate goods that raises their income more than in the baseline.

5.3 Endogenous interest rate

Our baseline model features a small open economy in which the real interest rate, r, is an exogenous parameter. Saez and Zucman (2019a) argue that accounting for open-economy effects is important in evaluating the effect of a progressive wealth tax. However, our results indicate that general equilibrium forces play crucial roles in modulating the policy's effects, and these forces could grow stronger if the decline in rich households' saving causes an increase in the interest rate. Here, we ask: how would our results change if we modeled a closed economy in which the interest rate was endogenous and entrepreneurs' demand for capital was equal to other households' supply of capital?

Our baseline model is not tractable in a closed-economy setting, so in this version of our analysis we employ a slightly different model setup that closely mirrors the model used by Guvenen et al. (2018). In this version of the model, households can work in the labor market and generate income as entrepreneurs—there is no occupational choice—and households can earn entrepreneurial income even after they retire.[10] We recalibrate the internally-calibrated parameters in this model to match the same three moments as in the baseline analysis.

The results of this exercise are shown in the fifth row of each panel in table 7. Compared to the baseline

[10] In our model, the supply of capital is very inelastic because there is a stronger motive to save for retirement as retired households cannot earn income from operating businesses. We prefer our model to the Guvenen et al. (2018) setup because it matches the wealth distribution more closely and generates realistic predictions about entrepreneurship. Open-economy versions of both models yield very similar results, and the closed-economy Guvenen et al. (2018) model is not computationally tractable in a transition-dynamics analysis; only long-run analysis is feasible with this model.

analysis, wealth tax revenues and transfers rise more, wealth inequality falls further, and there is a larger macroeconomic contraction. This is because the equilibrium interest rate rises by 16 basis points, which creates additional downward pressure on entrepreneurs' capital demand but facilitates more wealth accumulation by households that are not subject to the tax. The consumption equivalent welfare gain is larger in this version of the analysis than in the baseline, especially in the first specification. The left half of table 9, which shows newborn households' welfare gains by ability type in this version of the analysis, shows that the increase in welfare gains relative to the baseline is evenly distributed across households; households in all four quadrants of the ability space see higher welfare gains.

We urge caution in comparing the welfare results of this analysis with our baseline results because there is no distinction between workers and entrepreneurs in this version of the model. All households lose from the decline in wages, but they all gain from the increase in entrepreneurial incomes caused by the increase in capital prices. In a version of this analysis with occupational choice, it is likely that workers' welfare would fall more than in the baseline, especially in the second tax evasion specification, because the macroeconomic contraction is more severe.

5.4 Housing wealth vs. non-housing wealth

Our baseline model, like many models used in the quantitative public finance literature, features one form of financial wealth that can be used to smooth consumption over time and as entrepreneurial collateral. Rotberg (2019) shows that modeling housing wealth in addition to financial wealth is important for accurately measuring the effects of wealth and capital income taxes.[11] Here, we ask: does incorporating a housing market into our model affect our findings about the impact of a progressive tax on rich households' wealth?

In this version of our model, households have preferences over consumption and housing, and they can take out mortgages to purchase houses or rent them from a competitive rental company as in Kaplan et al. (2019). Entrepreneurs can use the net equity in their homes as collateral as well as their financial wealth to obtain larger capital loans. Rental units have a minimum size, which means that low-income households spend more of their income on housing. See Rotberg (2019) for further details on the model's description. In addition to the three calibration targets in our baseline analysis, we also target the home-ownership rate, the ratio of house prices to household income, and the ratio of land prices to house prices in our calibration of this version of the model. Like the baseline model, this version matches the wealth distribution closely, but it also matches the composition of wealth along this distribution; rich households' wealth consists mostly of financial assets, while poorer households' wealth is mostly composed of housing. This version of the model also generates realistic variation in home-ownership rates along the wealth distribution and realistic housing costs relative to income for renters.

The last row in each panel of table 7 shows the results of this sensitivity analysis. The effect of the policy

[11] Like Guvenen et al. (2018), Rotberg (2019) analyzes flat wealth taxes that affect all households, not progressive wealth taxes like we analyze in this paper.

change on public finances, macroeconomic variables, and wealth inequality are similar to the baseline results in both tax evasion specifications. The welfare gains are substantially larger, however, and even in the second specification the approval rate is almost 90 percent. This is because the minimum rental unit size creates an income effect: low-income households are forced to spend more of their income on rent, and so the transfers of wealth tax revenue have a higher marginal value for these households. The right panel of table 9, which shows that households with low labor market and entrepreneurial abilities see particularly large increases in their welfare gains in this version of the exercise, provides additional support for this mechanism. These results lend credence to the baseline model's predictions about the effects of a progressive wealth tax on macroeconomic dynamics, public finances, and inequality, and suggest that popular support for the policy might be even more widespread than the baseline analysis indicates.

6 Conclusion

Rich households' share of wealth is growing and progressive policymakers have proposed taxing these households' assets to curb this trend. Economists like Saez and Zucman (2019a,b) estimate that a progressive wealth tax could raise substantial tax revenues in the short run, but little is known about how this kind of policy would cause the wealth distribution to evolve over time or what macroeconomic consequences would follow. In this paper, we fill this gap by using an overlapping-generations model with heterogeneity in entrepreneurial skill to quantitatively assess the short- and long-run consequences of progressive wealth taxation for public finances, wealth inequality, macroeconomic dynamics, and welfare.

Our analysis is a case study of a high-profile proposal by Senator Elizabeth Warren, who has suggested a two percent tax on household wealth over fifty million dollars and a surtax of one percent on wealth of over one billion dollars. We use our model to simulate the transition dynamics that would follow the implementation of this policy under two scenarios that feature different assumptions about the nature of tax evasion. In the first scenario, households evade a fraction of their wealth taxes but their hidden wealth remains onshore. In the second scenario, households shift a fraction of their taxable wealth offshore, removing it from domestic production. In both scenarios, revenue from the wealth tax is redistributed in a lump-sum fashion; these transfers are particularly valuable for low-income households.

We find that this policy would indeed be effective at reducing the richest households' share of wealth: in the long run, the share of wealth held by the top 0.1 percent of households would fall by one quarter to one third. In the short run, this policy would also raise substantial tax revenues: about two thirds of a percent of GDP or about $130 billion. These revenues would fall as the wealth distribution grows less concentrated, however, and in the long run they would fall by 50 to 60 percent. Moreover, this policy would have little effect on wealth inequality among other households; the Gini coefficient of wealth would remain largely unaffected.

We also find that a progressive wealth tax would cause a macroeconomic contraction regardless of whether tax evasion shifts capital offshore, but the timing and extent of this contraction depend crucially on the nature of tax evasion. In the first specification, where hidden wealth remains onshore, there would be no short-run macroeconomic effect, and output and wages would fall gradually over time. In the second specification, however, where hidden wealth is removed from domestic production, output and wages would fall immediately when the tax is implemented, and they would fall further in the long run. In both cases, the macroeconomic transition exhibits significant overshooting: output and wages would fall for about fifty years after the policy is implemented, but then would begin to recover.

Despite the decrease in wages and economic activity that it would cause, a progressive wealth tax would raise aggregate welfare and would enjoy majority support regardless of whether tax evasion shifts capital offshore. The size of the welfare gains and the extent of support for the policy would change dramatically over the course of the transition, however, especially if capital does indeed move offshore. In the short run, welfare gains would be large and popular support would be widespread; in the period in which the policy is implemented, aggregate welfare would rise by 0.64 percent in the first specification of our model and 0.58 percent in the second, and all but the top 0.1 percent of households who are subject to the tax would approve of it in both specifications. In the long run, welfare gains would fall by 36 percent and 69 percent in the two specifications, respectively, and while approval would remain high in the first specification, only a slim majority would approve of the wealth tax in the long run in the second specification.

The distribution of the welfare consequences of a progressive wealth tax also depends crucially on the nature of wealth tax evasion, especially in the long run. All newborn households would gain in the first specification, but many newborn working households would lose in the second specification because the decline in their wages would exceed the wealth tax revenue transfers they would receive. Conversely, newborn entrepreneurs would actually gain more in this specification, as their business incomes would rise more dramatically due to a larger decline in competition from the older, wealthier entrepreneurs who are hit by the tax. In fact, young entrepreneurs reap the largest benefits from this policy in both tax evasion specifications, in both the short run and the long run, and across all of our sensitivity analyses and extensions. Policymakers who argue that a progressive wealth tax would benefit poorer households at the expense of the rich should pay close attention to these findings.

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Table 1: Assigned parameter values

Parameter	Description	Value	Target or source
(a) Demographics and preferences			
J	Lifespan	60	Max. lifespan of 86 years
R	Retirement age	20	Retirement at age 66
ϕ_j	Survival prob.	Varies	Arias (2014)
σ	Risk aversion	2	Standard
(b) Labor market ability			
e	Stoch. labor ability	$\{0.14, 0.32, 0.49, 1.0\}$	McNeil (2001)
$F(e)$	Ergodic labor ability dist.	$\{0.2, 0.2, 0.2, 0.4\}$	McNeil (2001)
$F(e'\|e)$	Labor ability trans. probs.	Varies	Burkhauser et al. (1997)
ζ_j	Life-cycle labor ability	$1 + \min\{0.38j/30, 0.38\}$	Guvenen et al. (2019)
(c) Production and entrepreneurial ability			
α	Capital share	0.4	Guvenen et al. (2018)
ν	CES curvature	0.9	Guvenen et al. (2018)
δ	Depreciation rate	0.05	Guvenen et al. (2018)
ρ_z	Intergen. persist.	0.15	Fagereng et al. (2018)
(d) Taxes and interest rates			
τ_c	Consumption tax	0.075	McDaniel (2007)
τ_k	Capital income tax	0.25	McDaniel (2007)
τ_r	Investment income tax	0.15	U.S. tax code
$\tau_\ell(e)$	Labor income tax	Varies	U.S. tax code
$\bar{B}$	Social security benefit	$0.4\times$ avg. labor income	U.S. SSA
r	Real interest rate	0.008	Mehra and Prescott (1985)

Table 2: Jointly calibrated parameters

Parameter	Description	Value	Target statistic	Source
β	Discount factor	0.948	Net wealth/GDP = 4.79	SCF (2016)
σ_z	Std. dev. entr. ability	0.291	Top 0.1% share = 15%	SCF (2016)
λ	Collateral constraint	1.297	Debt/assets = 0.31	Asker et al. (2011)

Table 3: Non-targeted moments

Statistic	Model	Data	Source
(a) Wealth distribution			
Top 0.01% share	5%	5%	SCF (2016)
Top 1% share	39%	39%	SCF (2016)
Top 10% share	68%	77%	SCF (2016)
Top 20% share	79%	88%	SCF (2016)
Bottom 50% share	5%	1%	SCF (2016)
Gini coefficient	0.78	0.86	SCF (2016)
(b) Other statistics			
Entrepreneurship rate	7.7%	7.6%	Cagetti and De Nardi (2009)
Avg. pre-tax return	5.1%	7.1%	Piketty (2014)
Bequests/Net wealth	1.5%	1.2%	Nishiyama (2000)
Revenue from τ_k, τ_r/Total revenue	27%	27%	OECD (2011)

Table 4: Effects of the wealth tax

	Public finance		Macro variables		Wealth inequality		Welfare	
Years since policy change	Tax revenue (% GDP)	Transfer (% avg. wage)	GDP (% chg.)	Wage (% chg.)	Top 0.1% share (p.p. chg.)	Gini (p.p. chg.)	CE (% chg.)	Approval (%)
(a) Scenario 1: Hidden wealth used in production								
0	0.63	0.96	-	-	-	-	0.64	99.88
5	0.59	0.86	-0.19	-0.15	-0.46	-0.12	0.55	99.88
10	0.54	0.75	-0.36	-0.27	-0.97	-0.23	0.46	99.88
25	0.44	0.57	-0.60	-0.44	-2.09	-0.45	0.31	99.80
50	0.37	0.45	-0.74	-0.53	-2.98	-0.57	0.25	88.96
∞	0.33	0.39	-0.63	-0.43	-3.49	-0.62	0.41	99.88
(a) Scenario 2: Hidden wealth held offshore								
0	0.64	0.88	-0.48	-0.48	-	-	0.58	99.89
5	0.58	0.76	-0.64	-0.54	-0.59	-0.13	0.46	99.08
10	0.52	0.64	-0.78	-0.58	-1.27	-0.28	0.36	85.46
25	0.39	0.41	-1.00	-0.65	-2.78	-0.58	0.18	68.38
50	0.29	0.26	-1.11	-0.69	-3.99	-0.78	0.11	52.71
∞	0.25	0.23	-0.90	-0.56	-4.61	-0.87	0.18	54.66

Table 5: Welfare effects by age group and entrepreneurial ability (% chg.)

	Year of policy change						Long run					
$z\backslash j$	25–34	35–44	45–54	55–64	65–74	75–85	25–34	35–44	45–54	55–64	65–74	75–85
(a) Scenario 1: Hidden wealth used in production												
z_1	+0.67	+0.62	+0.60	+0.62	+0.65	+0.72	+0.24	+0.21	+0.21	+0.23	+0.27	+0.28
z_2	+0.67	+0.62	+0.60	+0.62	+0.65	+0.72	+0.25	+0.22	+0.22	+0.23	+0.27	+0.28
z_3	+0.66	+0.62	+0.60	+0.62	+0.65	+0.72	+0.27	+0.24	+0.24	+0.26	+0.29	+0.31
z_4	+0.66	+0.62	+0.60	+0.62	+0.65	+0.71	+0.29	+0.25	+0.25	+0.27	+0.30	+0.31
z_5	+0.66	+0.62	+0.60	+0.62	+0.65	+0.71	+0.34	+0.32	+0.31	+0.33	+0.36	+0.37
z_6	+0.73	+0.67	+0.62	+0.58	+0.59	+0.65	+0.55	+0.66	+0.80	+0.90	+0.90	+0.84
z_7	+1.13	+0.95	+0.74	+0.52	+0.48	+0.54	+1.10	+1.73	+2.17	+2.46	+2.47	+2.45
z_8	+1.10	+0.13	-2.36	-6.84	-6.65	-4.18	+2.43	+5.84	+5.03	-1.46	-6.21	-9.01
z_9	+0.93	-2.33	-16.63	-35.13	-37.56	-35.64	+1.36	-0.27	-13.30	-31.69	-38.95	-43.65
(b) Scenario 2: Hidden wealth held offshore												
z_1	+0.54	+0.49	+0.47	+0.55	+0.66	+0.68	-0.11	-0.13	-0.12	-0.09	-0.06	-0.06
z_2	+0.54	+0.49	+0.47	+0.55	+0.66	+0.68	-0.09	-0.11	-0.11	-0.08	-0.05	-0.06
z_3	+0.53	+0.49	+0.47	+0.55	+0.66	+0.68	-0.06	-0.09	-0.08	-0.06	-0.03	-0.04
z_4	+0.53	+0.49	+0.47	+0.55	+0.67	+0.68	-0.02	-0.06	-0.06	-0.03	-0.01	-0.03
z_5	+0.54	+0.49	+0.48	+0.56	+0.67	+0.68	+0.06	+0.03	+0.02	+0.05	+0.07	+0.05
z_6	+0.69	+0.64	+0.60	+0.59	+0.60	+0.62	+0.41	+0.62	+0.86	+1.01	+0.99	+0.87
z_7	+1.51	+1.51	+1.29	+0.88	+0.60	+0.71	+1.32	+2.21	+2.84	+3.22	+3.25	+3.22
z_8	+1.69	+0.61	-2.81	-8.50	-7.13	-4.50	+2.81	+6.05	+3.87	-4.92	-10.22	-12.95
z_9	+1.59	-3.99	-26.86	-44.09	-40.15	-38.33	+1.87	-1.97	-24.73	-47.64	-53.89	-57.42

Table 6: Welfare effects of newborns by labor and entrepreneurial abilities (% chg.)

	Year of policy change				Long run			
$z \setminus e$	e_1	e_2	e_3	e_4	e_1	e_2	e_3	e_4
(a) Scenario 1: Hidden wealth used in production								
z_1	+1.11	+0.79	+0.49	+0.33	+0.47	+0.32	+0.17	+0.09
z_2	+1.10	+0.78	+0.49	+0.33	+0.48	+0.33	+0.18	+0.10
z_3	+1.09	+0.78	+0.49	+0.33	+0.50	+0.35	+0.20	+0.12
z_4	+1.09	+0.77	+0.49	+0.33	+0.53	+0.38	+0.22	+0.14
z_5	+1.08	+0.77	+0.49	+0.34	+0.58	+0.42	+0.26	+0.17
z_6	+1.14	+0.84	+0.57	+0.45	+0.72	+0.56	+0.40	+0.32
z_7	+1.44	+1.22	+1.03	+0.95	+0.99	+0.90	+0.82	+0.80
z_8	+1.96	+1.64	+1.02	+0.74	+1.37	+1.24	+0.86	+0.73
z_9	+2.48	+1.46	+0.94	+0.68	+1.59	+1.16	+0.91	+0.83
(b) Scenario 2: Hidden wealth held offshore								
z_1	+1.08	+0.68	+0.32	+0.13	+0.06	-0.05	-0.15	-0.20
z_2	+1.07	+0.68	+0.32	+0.13	+0.09	-0.02	-0.12	-0.18
z_3	+1.06	+0.67	+0.32	+0.13	+0.13	+0.01	-0.09	-0.15
z_4	+1.06	+0.67	+0.32	+0.13	+0.17	+0.06	-0.06	-0.12
z_5	+1.07	+0.68	+0.33	+0.14	+0.26	+0.13	+0.00	-0.07
z_6	+1.21	+0.82	+0.48	+0.32	+0.51	+0.37	+0.24	+0.19
z_7	+1.75	+1.48	+1.26	+1.17	+1.04	+0.99	+0.95	+0.96
z_8	+2.52	+2.20	+1.37	+1.03	+1.71	+1.58	+1.17	+1.02
z_9	+3.25	+2.04	+1.35	+1.02	+2.02	+1.74	+1.43	+1.28

Table 7: Long-run effects of the wealth tax: sensitivity analyses vs. baseline

	Public finance		Macro variables		Wealth inequality		Welfare	
Analysis version	Tax revenue (% GDP)	Transfer (% avg. wage)	GDP (% chg.)	Wage (% chg.)	Top 0.1% share (p.p. chg.)	Gini (p.p. chg.)	CE (% chg.)	Approval (%)
(a) Scenario 1: Hidden wealth used in production								
Baseline	0.33	0.39	-0.63	-0.43	-3.49	-0.62	0.41	99.88
Partial eqm. (old W, new P)	0.33	0.51	-0.68	0.00	-3.50	-0.64	0.93	99.89
Partial eqm. (old P, new W)	0.31	-0.11	-2.60	-0.43	-3.60	-1.31	-0.51	0.00
Higher top 0.1% share	0.52	0.66	-0.71	-0.51	-4.47	-0.71	0.76	99.91
Endogenous r	0.42	0.55	-0.92	-0.93	-4.56	-1.72	0.86	99.88
Housing	0.42	0.34	-0.53	-0.35	-3.61	-0.86	1.08	99.87
(a) Scenario 2: Hidden wealth held offshore								
Baseline	0.25	0.23	-0.90	-0.56	-4.61	-0.87	0.18	54.66
Partial eqm. (old W, new P)	0.25	0.37	-0.95	0.00	-4.62	-0.90	0.82	99.89
Partial eqm. (old P, new W)	0.23	-0.41	-3.43	-0.56	-4.67	-1.74	-1.03	0.00
Higher top 0.1% share	0.39	0.38	-1.10	-0.70	-6.17	-1.08	0.34	74.65
Endogenous r	0.31	0.25	-1.33	-1.33	-6.16	-2.29	0.34	45.67
Housing	0.31	0.18	-0.80	-0.56	-5.00	-1.34	0.55	89.73

Table 8: Welfare effects of newborns by labor and entrepreneurial abilities: partial equilibrium (% chg.)

$z \setminus e$	Old W, new P				Old P, new W			
	e_1	e_2	e_3	e_4	e_1	e_2	e_3	e_4
(a) Scenario 1: Hidden wealth used in production								
z_1	+1.10	+0.93	+0.74	+0.63	-0.62	-0.60	-0.56	-0.54
z_2	+1.12	+0.94	+0.75	+0.64	-0.62	-0.60	-0.56	-0.54
z_3	+1.14	+0.96	+0.77	+0.66	-0.62	-0.59	-0.56	-0.54
z_4	+1.16	+0.98	+0.78	+0.68	-0.61	-0.59	-0.56	-0.54
z_5	+1.21	+1.02	+0.82	+0.71	-0.60	-0.58	-0.55	-0.53
z_6	+1.32	+1.14	+0.94	+0.84	-0.58	-0.56	-0.54	-0.52
z_7	+1.48	+1.39	+1.28	+1.22	-0.50	-0.48	-0.46	-0.44
z_8	+1.78	+1.60	+1.21	+1.08	-0.31	-0.37	-0.45	-0.49
z_9	+1.88	+1.37	+1.15	+1.09	-0.20	-0.19	-0.28	-0.36
(b) Scenario 2: Hidden wealth held offshore								
z_1	+0.85	+0.71	+0.57	+0.48	-1.34	-1.22	-1.09	-1.01
z_2	+0.88	+0.74	+0.59	+0.50	-1.33	-1.22	-1.08	-1.01
z_3	+0.91	+0.77	+0.61	+0.53	-1.32	-1.21	-1.08	-1.00
z_4	+0.95	+0.80	+0.64	+0.56	-1.30	-1.19	-1.07	-1.00
z_5	+1.03	+0.87	+0.70	+0.61	-1.28	-1.18	-1.05	-0.99
z_6	+1.24	+1.08	+0.91	+0.83	-1.19	-1.10	-0.99	-0.91
z_7	+1.64	+1.58	+1.51	+1.49	-0.90	-0.82	-0.73	-0.66
z_8	+2.12	+1.99	+1.59	+1.45	-0.52	-0.52	-0.56	-0.59
z_9	+2.33	+1.92	+1.67	+1.57	-0.35	-0.13	-0.21	-0.33

Table 9: Long-run welfare for newborns by labor and entrepreneurial abilities: alternative models (% chg.)

	Endogenous r				Housing			
$z \setminus e$	e_1	e_2	e_3	e_4	e_1	e_2	e_3	e_4
(a) Scenario 1: Hidden wealth used in production								
z_1	+1.19	+0.91	+0.64	+0.52	+1.63	+1.16	+0.76	+0.56
z_2	+1.94	+0.92	+0.66	+0.53	+1.65	+1.18	+0.78	+0.57
z_3	+1.20	+0.93	+0.67	+0.55	+1.67	+1.20	+0.80	+0.59
z_4	+1.21	+0.95	+0.69	+0.57	+1.70	+1.23	+0.82	+0.61
z_5	+1.16	+0.89	+0.62	+0.49	+1.74	+1.27	+0.86	+0.65
z_6	+1.34	+1.07	+0.79	+0.65	+1.88	+1.42	+1.01	+0.80
z_7	+2.15	+1.84	+1.53	+1.37	+2.14	+1.71	+1.35	+1.13
z_8	+2.66	+2.08	+1.54	+1.18	+2.26	+1.69	+1.08	+0.88
z_9	+3.07	+2.44	+1.95	+1.58	+2.64	+1.24	+0.89	+0.73
(b) Scenario 2: Hidden wealth held offshore								
z_1	+0.39	+0.17	-0.02	-0.11	+0.51	+0.27	+0.06	-0.05
z_2	+0.41	+0.19	+0.00	-0.09	+0.56	+0.31	+0.10	-0.02
z_3	+0.44	+0.23	+0.04	-0.05	+0.63	+0.37	+0.15	+0.02
z_4	+0.48	+0.27	+0.08	-0.01	+0.71	+0.44	+0.20	+0.07
z_5	+0.48	+0.26	+0.05	-0.05	+0.83	+0.53	+0.28	+0.14
z_6	+0.97	+0.76	+0.56	+0.45	+1.29	+0.96	+0.66	+0.53
z_7	+2.47	+2.23	+1.95	+1.79	+2.26	+2.05	+1.76	+1.54
z_8	+3.55	+2.89	+2.18	+1.69	+3.19	+2.65	+1.98	+1.64
z_9	+4.57	+3.68	+2.94	+2.34	+3.85	+2.82	+2.21	+1.83

Figure 1: Wealth inequality over time

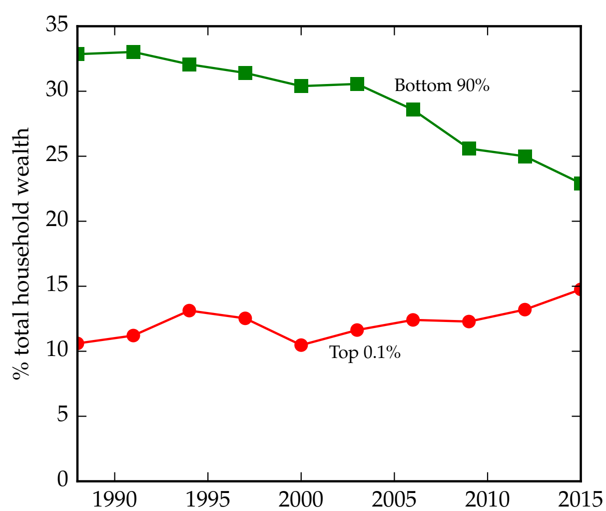

Figure 2: Transition dynamics of wealth tax revenue and transfers

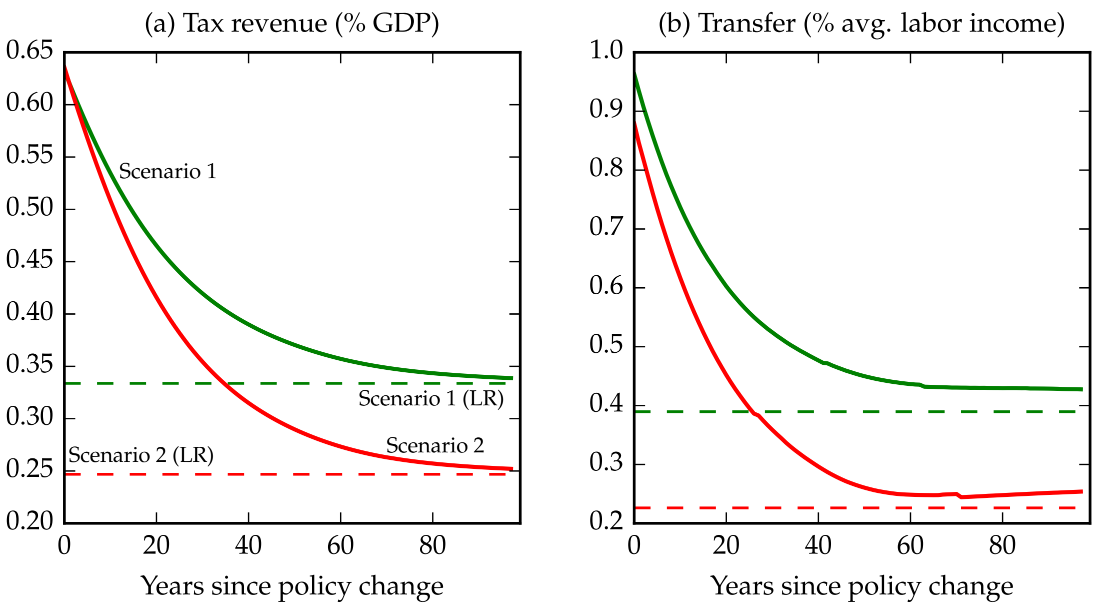

Figure 3: Transition dynamics of wealth inequality

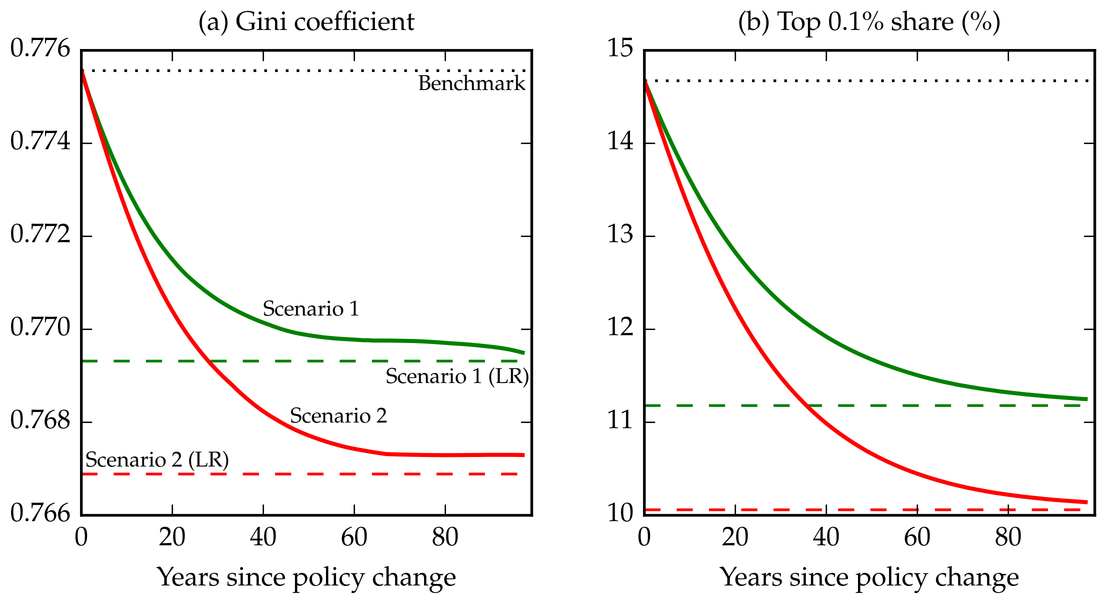

Figure 4: Transition dynamics of macroeconomic variables

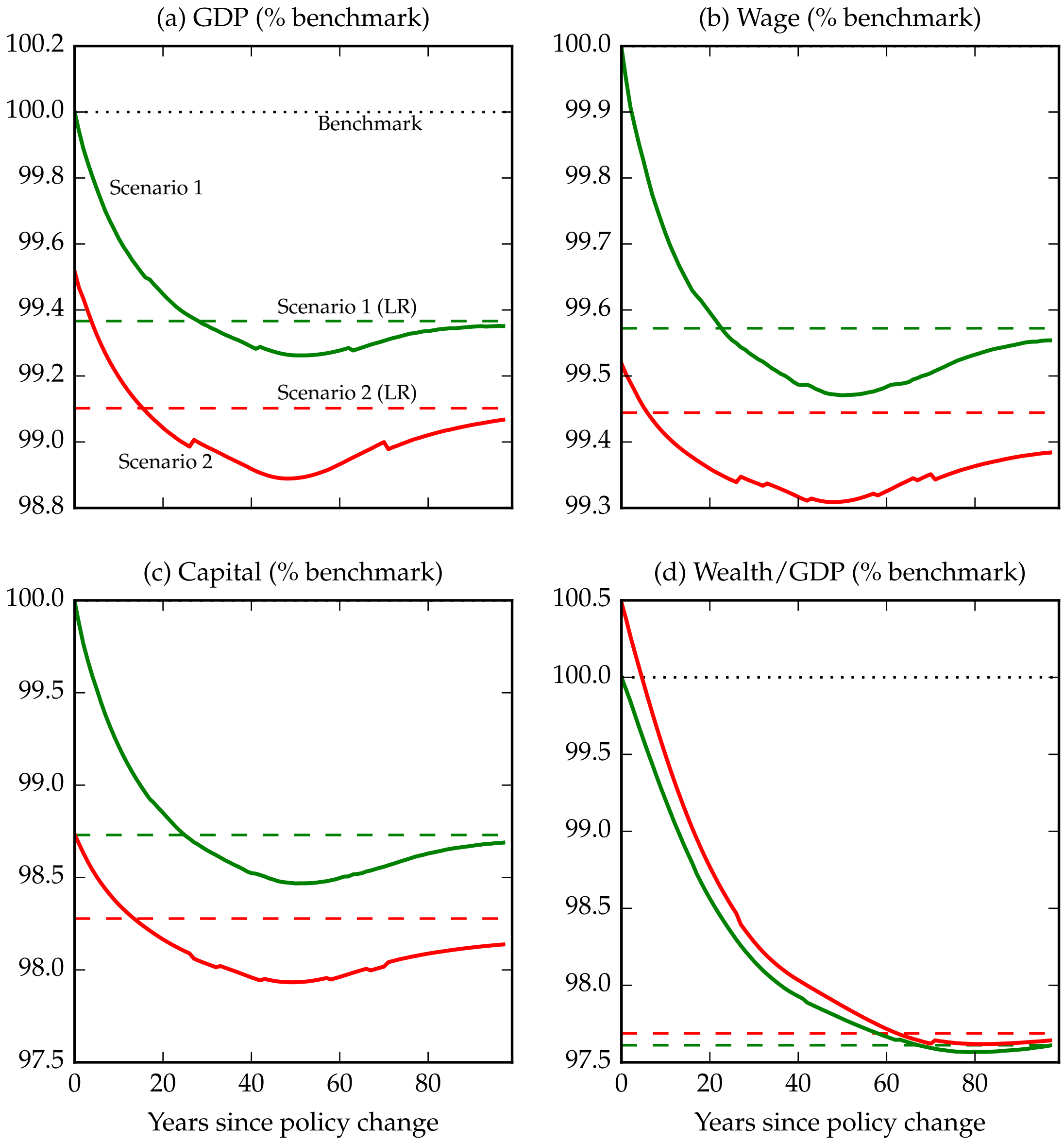

Figure 5: Transition dynamics of entrepreneurship